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VAN VLOTEN (H.). **Is verrijking van de mycoflora mogelijk? (Naar aanleiding van de Populierenroest).** [Is enrichment of the mycoflora possible? (With reference to Poplar rust).]—*Tijdschr. PlZiekt.*, l, 5–6, pp. 49–62, 4 pl., 1944. [English summary.]

Following a general discussion as to the possibilities of enrichment of the mycoflora of a country, illustrated by some well-known concrete examples, the author treats in greater detail the distribution of poplar rusts (*Melampsora* spp.) over the globe and the well-founded risks of the reciprocal transmission of North American species into Europe and of European ones into North America. To avoid misapprehension it is pointed out that the term 'enrichment' of the mycoflora is strictly applicable to the development of new elements through introduction from other countries, by hybridization, and by fungal mutations, but not to the simple detection of a hitherto unknown fungus, which may merely have escaped observation.

With one exception all the poplar rusts are heteroecious, the single known autoecious species being that originally described by Barclay from the Himalayas as *M. aecidioides* on *Populus alba* (*J. Asiat. Soc. Beng.*, lx, 2, pp. 211–230, 1891) and in 1933 recorded by Arthur and Cummins under the same name from Kashmir [*R.A.M.*, xiii, p. 185]. According to Klebahn (Kryptogamenflora der Mark Brandenburg, Pilze III, 1914), *M. aecidioides* is a collective name for four species occurring on *P. alba* in Europe, viz., *M. larici-tremulae*, *M. pinitorqua*, *M. magnusiana*, and *M. rostrupii*, while Jørstad [*R.A.M.*, xv, p. 618] unites the same four under the designation of *M. tremulae*, with *M. aecidioides* as a possible fifth, the extra-European stations of which are probably introductions. Apart from this virtually ubiquitous species, the poplar rusts are more restricted in their distribution, and the European species, e.g., *M. larici-populina* and *M. allii-populina*, fall into quite a different category from the typical North American *M. medusae* [ibid., xix, p. 240; xxii, p. 498], *M. albertensis* [ibid., xxi, p. 173; xxii, p. 503], *M. abietis-canadensis* [ibid., xxii, p. 434], and *M. occidentalis*. The two European species have spread over great distances, *M. larici-populina* having been reported, for instance, by Hiratsuka from Japan [ibid., xi, p. 405] and Fresa from Argentina [ibid., xvi, p. 5], and *M. allii-populina* from Morocco [ibid., xvi, p. 207], Palestine [ibid., xv, p. 683], and Argentina [ibid., xvii, p. 83].

With the aid of a special laboratory technique the writer demonstrated the development in 1941 of three physiologic races, (a), (b), and (c), and a white variant (d), closely resembling (c), of *M. larici-populina*, which were mutually distinguishable by the reactions to inoculation with them of eight poplar varieties. Thus, (a) from *P. marilandica* and (b) from *P. eugenii* can be differentiated by their effects on *P. candicans*, which is susceptible to the former and immune from the latter, while both are entirely distinct from (c) and the white variant from *P. candicans*. Inoculations on the last-named species with (c) and the variant resulted in damage exceeding any previously observed by the writer over a protracted period in Holland: premature defoliation was the rule, and the few leaves still

attached to the tree at the beginning of September were extensively discoloured and covered with uredo- and teleutosori. *P. serotina* is susceptible to all three races and the variant; *P. regenerata* moderately susceptible and susceptible, respectively, to (a) and (b), and semi-immune and immune, respectively, from (c) and the variant; *P. marilandica* susceptible to (a) and (b), fairly resistant to (c), and moderately susceptible to the variant; *P. eugenii* fairly resistant to moderately susceptible to (a), susceptible to (b), resistant to (c), and semi-resistant to the variant; *P. robusta* susceptible to all four—lightly so to (a); *P. gelrica* semi- to moderately resistant to (a), moderately susceptible to susceptible to (b), and resistant to or immune from (c) and the variant; *P. candicans*, the reactions of which to the last-named have already been discussed, is susceptible to (a) and immune from or resistant to (b); and, finally, *P. generosa* is fairly resistant to moderately susceptible to (a) and (c), fairly resistant to (b), and resistant to moderately susceptible to the variant.

The development of the new races is assumed to be due to the interplanting of larches (the alternate host of *M. larici-populina*) among the poplars in the experimental plot, thereby affording opportunities for interracial hybridization. Like the adventitious introduction of foreign species, this method of enrichment of the existing rust flora adds an element of uncertainty to the work of breeding for resistance.

Vanselow (A. P.). **The minor element content of normal, manganese-deficient, and manganese-treated English Walnut trees.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 15–20, 1945.

Spectrographic analyses of leaves from treated and untreated manganese-deficient walnut trees and from normal walnut trees showed that manganese deficiency can be remedied by spraying in early summer with manganese sulphate or by injection of the dry salt into the trunk or limbs.

Robak (H.). **Cultural studies in some Norwegian wood-destroying fungi. A biological study and a contribution to diagnostics of wood decay.**—*Medd. Vestland. forstl. Forsøkssta.* 25, 248 pp., 11 pl., 8 figs., 25 diags., 10 graphs, 1942. [Norwegian summary. Received November, 1945.]

The tetrapolar segregation of the sexes previously demonstrated or suggested in the author's studies of *Stereum purpureum*, *Corticium evolvens*, and *Polyporus* [*Polystictus*] *abietinus* [*R.A.M.*, xvi, p. 7] has been confirmed by further work, while *Lenzites sepiaria* and *Trametes serialis* were again shown to pursue a bipolar course of sexual differentiation. *T. odorata* [ibid., xviii, p. 215] also proceeded along bipolar lines, though staling phenomena in the culture media greatly impeded observations on this species.

From a cytological investigation of *S. sanguinolentum* it is concluded that in the majority of the basidia spore formation is parthenogenetic, any caryogamy that may occur taking place between sister nuclei.

Two Norwegian strains of *S. purpureum* were interfertile, as were also the same strains and a Canadian isolate referred to *S. rugosiusculum* Berk. & Curt. [ibid., xix, p. 239]; the latter name is therefore regarded as a synonym of the former. Interfertility also characterized the Norwegian strains of *P. abietinus*. All the Norwegian isolates of *L. sepiaria* were interfertile, as were also some Norwegian and Canadian isolations. All the Norwegian strains of *T. serialis* were interfertile, but a Canadian isolate of the same fungus did not intermingle with them at all. Although so closely similar in colour, texture, and pathogenicity, *L. sepiaria* and *T. odorata* (*T. americana* Overh.) were quite intersterile [ibid., xv, p. 761], and there seems to be no valid reason to follow American procedure in uniting the two species under the former name [ibid., xiv, p. 795].

The cultural characters of the fungi under discussion are exhaustively described

and discussed in relation to their application for diagnostic purposes. The optimum temperature for the development of *C. evolvens* and *S. sanguinolentum* was 23° C. or below, *S. purpureum* throve at 23° to 26°, *P. abietinus* and *T. serialis* at 27° to 28°, *T. odorata* at 28° to 30°, *L. sepiaria* at 32°, and the above-mentioned Canadian isolate of *T. serialis* at 35°.

The dry-weight losses caused by *L. sepiaria*, *T. serialis*, and *T. odorata* in pine and spruce sap and heartwood chips and blocks and spruce sapwood sawdust were roughly comparable, while those due to the action of *P. abietinus* and *S. sanguinolentum* were considerably lower in the chip and sawdust cultures but not in the blocks; in one pine sapwood block, in fact, *S. sanguinolentum* was responsible for more severe decay than any of the other species tested. *C. evolvens* and *S. purpureum* caused only negligible reductions in weight. The brown to brownish-red discolorations of the wood induced by the two species of *Stereum* and *P. abietinus* was often preceded in the case of *S. sanguinolentum* by a pale rose-mauve tinge. The observations made in this connexion on *P. abietinus* point to its implication in the etiology of the prevalent brownish-red storage rots of timber and pulp wood.

The two members of the brown-rot group, *T. serialis* and *L. sepiaria*, caused the expected heavy losses in cellulose and also, at an advanced stage of infection, considerable lignin decomposition [ibid., vi, p. 453; x, p. 148, *et passim*]. The white-rot fungi, *S. sanguinolentum* and *P. abietinus* [ibid., xii, p. 343], were less destructive than the foregoing, attacking cellulose and lignin in about equal proportions, with a slight preference for the former. Both groups caused appreciable disorganization of hemicelluloses. Monosporous mycelia of *P. abietinus*, *L. sepiaria*, and *T. serialis* brought about equally heavy dry-weight reductions with dicaryotic mycelia of the same species. When the three last-named fungi were cultured on spruce sawdust in association with bacteria isolated from decayed wood, an increase in the dry-weight loss occurred only in the case of *L. sepiaria*.

A ten-page bibliography is appended.

Reinmuth (E.). **Untersuchung über die Kohlherniebekämpfung durch Kalk.** [Investigations on Cabbage club-root control by means of lime.]—*Angew. Bot.*, xxv, 5–6, pp. 368–378, 4 figs., 1943. [Received November, 1945.]

From 1937 to 1942 the possibilities of combating crucifer club root (*Plasmodiophora*) [*brassicae*] in white mustard and *Camelina sativa* by means of lime [*R.A.M.*, iii, p. 620 *et passim*] were investigated at the Rostock (Germany) Agricultural Experiment Station. In pot tests in which caustic lime was applied at the rate of 2 kg. per sq.m. to the inoculated soil on 30th November, 1936, 4th January, 8th February, 15th March, 19th April, or 24th May, 1937, neither plant developed infection except in the final series, where the incidence amounted to 8·3 per cent. in mustard and 8·8 in *C. sativa*, the corresponding figures for the controls being 91·6 and 100 per cent., respectively. The soil P_H rose steadily from 7·9 to 8·5 up to and including the 19th April treatment; in the 24th May pots it was 7·9, and in the controls 6·2. In this connexion it is of interest to note that the P_H of the 30th November and 24th May series were identical, though the results of the earlier treatment were entirely satisfactory and those of the latter only partially so. In an outdoor trial in the following year, in which lime was applied on the same dates, all the treatments were equally effective in both crops apart from 1 per cent. infection on mustard in the February plots; in the controls the incidence of club root in mustard and *C. sativa* amounted to 44·5 and 6·9 per cent., respectively. In combined pot and field trials in 1938–9 the average percentage of infection in mustard ranged from 2·6 per cent. in the November series to 21·8 in that of March, sinking again to 19·3 in the May tests; in the case of *C. sativa* the minimum of 1 per cent. developed in the January, and the maximum of 12 in the May series.

The January and February treatments resulted in the most vigorous development of mustard and *C. sativa*, respectively.

In all the foregoing trials the soil amendment was applied directly to the test crop, and the question arose whether comparable effects could be secured by earlier treatments. Lime was accordingly applied in the autumn of 1939 to the carrot crop preceding the crucifers and found to give equally good control with the direct treatment, besides incidentally benefiting the carrots. In the untreated control plots there was 78·5 per cent. club root in the mustard and 10·2 in *C. sativa*.

In an experiment started on 9th April, 1942, to find the minimum dosage of lime required for effective control of *P. brassicae* on mustard, the crop produced by a sowing made on 12th May and treated with 1 kg. per sq.m. was perfectly healthy, while 2 per cent. infection developed in that sown on 23rd June and receiving the same quantity of fertilizer. Lower dosages of lime failed to prevent infection, though they somewhat mitigated its severity in the early-sown plots; such a degree of control, however, would scarcely be adequate, over a large acreage. At the rate of 1 kg. the soil amendment induced a P_H of 8·4, which lies well above the recorded limits for infection by *P. brassicae*.

WALKER (J. C.) & HOOKER (W. J.). **Plant nutrition in relation to disease development, II. Cabbage clubroot.**—*Amer. J. Bot.*, xxxii, 8, pp. 487–490, 1945.

After pointing out that cabbage yellows (*Fusarium oxysporum* f. *conglutinans*) [*F. conglutinans*: *R.A.M.*, xxiv, p. 484] may be classed as a hypoplastic disease, whereas cabbage club root (*Plasmodiophora brassicae*) is hyperplastic, and that Pryor's work on nutrients in relation to club root [ibid., xx, p. 147] indicated a response to nutrition at variance with that of yellows, the authors describe investigations carried out on the development of club root in young cabbage plants in relation to salt concentration and balance in the nutrient solution.

The results obtained showed that increase in salt concentration in a balanced solution tended to increase the disease index. Excess of potassium and of nitrogen increased it, while increase of phosphorus was of small effect. Omission of potassium or phosphorus generally decreased the disease index, whereas omission of nitrogen increased it. When light conditions and salt concentration were favourable to the growth of the host, the effect of salt balance was less apparent than it was in conditions in which the plants made slower growth.

MORRIS (H. E.) & AFANASIEV (M. M.). **Sugar Beet diseases and their control in Montana.**—*Bull. Mont. agric. Exp. Sta.* 427, 22 pp., 17 figs., 1945.

In this semi-popular account of the diseases of sugar beets in Montana it is stated that seedling diseases or 'black root' [cf. *R.A.M.*, xxii, p. 508] are of considerable importance, especially on the heavy, irrigated soils. Several organisms may be involved, and a slight difference in soil composition, soil temperature, or other factors may be responsible for variation in the pathogens causing the diseases. The most typical form of seedling disease locally is characterized by a browning and blackening of the hypocotyl and root, the discoloration generally extending above the ground. The death of the seedling may be rapid to very slow, and an affected plant often has a completely blackened hypocotyl, though its cotyledons may long remain turgid and green. *Phoma betae* and Phycomycetous fungi are associated with this type of disease. Studies on control showed that seed treatment is of doubtful benefit, but high fertility, due balance, and good physical condition of the soil are of great importance. The nature of the preceding crops influenced the amount of disease present, which increased progressively when the beets were planted after maize, potatoes, oats, lucerne, beans, and beets. The crop should be planted early, and preferably with segmented seeds. The soil should be well drained, and should be cultivated as soon as the drill rows can be

followed. If the disease is prevalent, thinning should be delayed until after the six-leaf stage.

Many fields in the irrigated valleys do not produce satisfactory yields of beets because of phosphorus or nitrogen deficiency, or both [ibid., xxiii, pp. 466, 510; xxiv, p. 87]. Studies at Huntley Field Station showed that beet rotations with lucerne always resulted in more symptoms of phosphorus deficiency than crops in continuous beets or those in two- or three-year rotations which had a very low amount of available phosphorus and nitrogen in the soil, as indicated by yields. To correct soil deficiencies in old lucerne ground the second cutting should be ploughed under at midsummer and then irrigated, in order to favour the decomposition of lucerne remnants during the current season, and make nutrients present in these remnants available for the next crop. The field should be fertilized with phosphorus before the lucerne is ploughed. Slight nitrogen deficiency in sugar beets may cause a rather early yellowing of the tops, while a severe shortage causes yellowing very early in the season, low yields of roots, and no significant response to a phosphate fertilizer. A liberal application of manure, supplemented by nitrogenous fertilizers, corrects the deficiency [cf. ibid., xxiv, p. 86].

Against yellows (*Fusarium conglutinans* var. *betae*) [ibid., x, p. 428; xxii, p. 50] the only feasible control method is a four- to five-year rotation.

Leaf spot (*Cercospora beticola*) [ibid., xxiii, p. 377; xxiv, p. 87] has been present in Montana for many years, but causes economic losses only occasionally in somewhat limited areas. The best methods of control consist in deep autumn ploughing, rotation, spraying with Bordeaux mixture or dusting with monohydrated copper sulphate or a fixed copper compound, and the use of resistant varieties. Against rot due to *Rhizoctonia* [*Corticium*] *solani* [ibid., xxi, p. 400; xxii, p. 284] there is no satisfactory method of control, though soil drainage and crop rotation are beneficial. Miscellaneous root rots, due to various soil fungi, including *Phoma*, *Rhizoctonia*, and *Fusarium*, are best countered by good growth conditions. Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [ibid., xxiii, p. 169] occurs occasionally in many fields, but seldom causes serious damage; a long rotation, including maize, small grains, or grasses, will reduce the likelihood of attack. Against curly top, resistant varieties and good cultural practices offer the best protection. Violet root rot (*R. crocorum*) [*Helicobasidium purpureum*: ibid., xix, p. 251; xxiii, p. 354] is of minor importance in Montana; a susceptible crop should not be planted in infected soil until at least four years have passed.

Price (W. C.). **The P_H stability of southern Bean mosaic virus.**—*Arch. Biochem., N.Y.*, viii, 1, pp. 13–19, 1945.

The P_H stability range of the southern bean mosaic virus [*R.A.M.*, xxiv, p. 397] was determined for clarified juice samples from Bountiful bean at 3° C. and for purified virus at 3° and 27°. There was little or no difference in the stability of the virus in the two types of preparation, but the P_H stability range was much narrower at 27° than at 3°. The virus was relatively stable for a week at P_H 5 to 6·7 at 27°, and for 37 days at P_H 4 to 8 at 3°. The P_H of maximum stability (5·2 to 6·9) did not coincide with that of maximum infectivity on Early Golden Cluster bean plants, which fell within the somewhat alkaline range of P_H 6·2 to 7·9.

Godfrey (G. H.). **Onion leaf 'blight' reduced by spraying.**—*Plant. Dis. Reptr*, xxix, 23–24, pp. 652–654, 1945. [Mimeographed.]

In a comparison of the respective merits of Bordeaux mixture 5–5–50 and the organic fungicide dithane [*R.A.M.*, xxiv, p. 69] plus zinc sulphate and lime ($1\frac{1}{2}$–1–$\frac{1}{2}$ lb. to 100 gals.), in experiments at the Lower Grande Valley Experiment Station for the control of leaf blight of Bermuda onions due to the fungus *Macrosporium* [*Alternaria*] *porri* [ibid., xxii, p. 237], 89 per cent. of the plants treated with

Bordeaux mixture and 95 per cent. of those treated with dithane survived, as against 70 per cent. in the unsprayed controls, whilst the average number of green leaves per plant were 3·4, 3·7, and 1·9, respectively. The first application was given on 8th January and further applications at weekly intervals. By the time of the third the treated rows stood out conspicuously from the controls, though at the start considerable infection was present.

NIEDERHAUSER (J. S.). **Control of Lettuce gray mold with thiosan.**—*Plant. Dis. Reptr*, xxix, 23–24, pp. 650–652, 1945. [Mimeographed.]

Tests against grey mould (*Botrytis cinerea*) with dust applications made weekly, using approximately 1 to 1½ lb. thiosan [*R.A.M.*, xxiii, p. 32], diluted with talc, per 1,000 sq. ft., showed that the dust markedly reduced infection, from 9·2 per cent. in the control to 0·1 per cent. in plants given eight dustings, and no injury was done to lettuce plants even where the dust was applied at a much heavier rate than usual. There are indications that thiosan might be used effectively for spraying out-of-doors, and more conveniently, as it is irritating if inhaled and a mask was worn in making indoor applications. Dusting tables, of which two are presented, show that the operation is much more effective in the early seedling and pricker stages of growth in reducing the amount of grey mould than after the plants have been set out in the greenhouse beds.

MIX (A. J.). **Aphanomyces rootrot of Lettuce, Pepper, and Eggplant seedlings in northern New Jersey.**—*Plant. Dis. Reptr*, xxix, 23–24, pp. 649–650, 1945. [Mimeographed.]

A root rot disease of lettuce seedlings was observed in northern New Jersey in January, 1945, and subsequently appeared to be caused by a species of *Aphanomyces*, oospores of which were present in the browned cortex of the diseased roots. About half the seed used failed to germinate in unsterilized soil, a number of seedlings soon died, and others put forth new roots and survived. The fungus was isolated, but the culture was lost by delay in making transfer. In April a similar root rot was found affecting [chilli] pepper and eggplant seedlings planted during the abnormally warm weather in March. A species of *Aphanomyces* was isolated from the pepper seedlings, and lettuce seedlings planted in sterilized soil mixed with inoculum of the fungus developed characteristic root-rot symptoms, with oospores present in the browned cortex. Seed sown in sterilized, uninoculated soil produced healthy seedlings. No attempt has yet been made to determine the species of *Aphanomyces* involved.

OLIVE (L. S.), BAIN (D. C.), & LEFEBVRE (C. L.). **A leaf spot of Cowpea and Soybean caused by an undescribed species of Helminthosporium.**—*Phytopathology*, xxxv, 10, pp. 822–831, 4 figs., 1945.

In August, 1944, cowpea leaves over a 50-acre area near La Place, Louisiana, were severely attacked by a hitherto undescribed species of *Helminthosporium*, which is named *H. vignae* Olive, n.sp. and was subsequently found to be associated with specimens of the same host from North and South Carolina, and also with soy-beans similarly affected in Florida in 1943.

The first symptoms of the disease, to which the common name of 'target spot' is applied, on cowpea leaves are reddish-purple dots, gradually expanding into prominent, brown, circular areas, often surrounded by wavy margins, and nearly always zonate at maturity, when the reddish-brown rings stand out against a paler brown background. In the final stages of infection the dead brownish tissue may rupture and fall out, leaving holes in the leaf suggestive of insect depredations. Very severe cases are characterized by chlorosis of the entire leaf and defoliation.

Most of the Louisiana specimens bore up to 50 or more zonate lesions, mostly 3 to 10 mm. in diameter, with a maximum of 2 cm. and a larger number of small, purplish, undeveloped spots. Later in the season the fungus was found to be producing numerous reddish-purple spots and streaks on the stems and petioles of cowpeas already debilitated by acute foliar infection; other organisms were usually concerned in this phase of the disease, and no doubt contributed to the intensity of the damage. The symptoms of the disease on sov-bean leaves were mild and the stems were not attacked.

In culture on Czapek's solution agar or potato dextrose agar *H. vignae* is characterized by dusky brown conidia, cylindrical or tapering towards the apex, often curved, usually occurring in chains of 2 to 5, 26 to 204 by 7 to 12 μ, 0- to 15-septate, borne on uni- to quadriseptate conidiophores, 26 to 440 by 4·5 to 8 μ, and hyaline chlamydospores, 16 to 30 by 14 to 20 μ. In nature the conidial dimensions range from 40 to 270 by 8 to 19 (average 100 to 180 by 15 to 18) μ, and the number of septa from 3 to 20 (10), the corresponding figures for the conidiophores being 44 to 380 (or 490) by 6 to 11 (typically 125 to 200 by 8) μ and 1 to 20 (3 to 5) septa.

H. vignae comprises two physiologic races, of which 1, isolated from Louisiana cowpea leaves, caused severe spotting of its own host in inoculation experiments and mild symptoms on soy-bean, and 2, derived from Mamredo soy-beans in Florida, induced light spotting of soy-bean and few to many very small spots of little consequence on cowpea foliage. The Iron cowpea variety sustained particularly heavy damage from race 1, Early Buff and Early Silver Crowder were also severely attacked, while Blackeye was the least affected.

Boswell (V. R.). **Disease resistant and hardy varieties of vegetables.**—*Nat. hort. Mag.*, xxiv, 4, pp. 268–273, 2 figs., 1945.

Continuing his useful survey of the present situation in the United States in respect of disease-resistant and hardy vegetable varieties [*R.A.M.*, xxiv, p. 216], the writer presents the latest information [already noticed in this *Review* from other sources] on tomatoes and chilli peppers resistant to wilt (*Fusarium* [*bulbigenum* var. *lycopersici* and *F. annuum*]), respectively, and a note on resistance to diseases in general in eggplants.

Boynton (D.). **Potassium deficiency in a New York Grape vineyard.**—*Proc. Amer. Soc. hort. Sci.*, xlvi, pp. 246–248, 1 fig., 1945.

In the summer of 1943, the third growing season after planting, Ontario, Niagara, Brighton, Portland, Caco, and Delaware vines in a vigorous three-acre vineyard near Penfield, New York, developed interveinal chlorosis and marginal leaf scorch. By harvest time almost all the leaves on many vines of the Delaware and Portland varieties were rolled and shrivelled or had abscissed. Foliar analyses showed that in the affected leaves potassium was very low and calcium and magnesium extremely high. Samples of surface soil from the affected area contained only half as much replaceable potassium as those from places where the symptoms were less severe, and analyses of leaves from slightly affected vines showed higher potassium than in those severely scorched.

In 1944, 240 vines of the varieties Delaware, Caco, and Ontario in the area affected the previous year were treated as follows: (*a*) $\frac{3}{4}$ lb. 60 per cent. potassium chloride in April and again in June, (*b*) no treatment, (*c*) as (*a*) plus 1 oz. borax in April and again in June, and (*d*) borax as in (*c*) but no potassium chloride. On 7th September the numbers of groups of three vines (considered as a single sample) that showed severe scorch were 0, 10, 0, and 5 for the four treatments, respectively, the corresponding percentages of potassium in the leaves (dry-weight basis) being $0{\cdot}69 \pm 0{\cdot}031$, $0{\cdot}36 \pm 0{\cdot}034$, $0{\cdot}68 \pm 0{\cdot}077$, and $0{\cdot}3 \pm 0{\cdot}023$. Response to the treatments was the same for all varieties. It seems evident that increase in leaf

potassium was associated with partial recovery from scorch, and further improvement is expected to follow another season's treatment.

CHRISTOFF [KHRISTOV] (A.). О цвѣтване на вируситѣи вируситѣ тѣла. [Staining of viruses and virus bodies.]—*Спис. земед. Опит. Инсти България.* [*J. agric. Exp. Stas Bulgaria*], xi, 3, pp. 43–50, 1941. [English summary. Received December, 1945.]

The author presents the results of his studies on the staining of pure viruses and of virus bodies in the cells of infected plants. In the first series of tests pure preparations of viruses were shown to differ in their reaction to dyes. Ordinary tobacco mosaic virus and potato virus X were found to exhibit common reactions to many dyes, while tomato bushy stunt virus showed in several respects different affinities; and in the case of certain dyes the response of tobacco mosaic virus and potato virus X was different.

In tests with infected plant material the results of staining tobacco mosaic virus particles were the same as those in the case of pure preparations of the virus. In tests undertaken with epidermal strips from the lower surface of leaves the inclusion bodies of severe etch [a strain of tobacco etch virus] and ordinary tobacco mosaic virus showed many distinctive reactions of the independent hosts on which they occurred [cf. *R.A.M.*, vii, p. 650; xix, p. 160]. Two tables, one showing the colour reactions of tobacco mosaic virus, potato virus X, and tomato bushy stunt to 65 dyes in acid and alkaline solutions, and the other that of nuclei, tobacco mosaic virus crystals, and severe etch virus bodies in tobacco and tomato plants to 23 dye treatments are provided. The reactions in the second table are considered to give some idea as to the possibility of developing sound methods for single or group determination and diagnosis of virus diseases through their virus bodies. There is a bibliography of 44 titles.

VANDERWALLE (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1941.** [Observations and researches carried out at the State Phytopathological Station during the year 1941.]—*Bull. Inst. agron. Gembloux*, xi, 1–4, pp. 147–156, 1942. [Flemish, English, and German summaries. Received January, 1946.]

In this report [cf. *R.A.M.*, xxiv, p. 491] it is stated, *inter alia*, that during 1941 wheat lodging (*Cercosporella herpotrichioides*) [ibid., xxiv, p. 183] was very prevalent in the vicinity of Gembloux, Belgium, and distinct differences in varietal susceptibility were observed. In one locality wheat glume blotch (*Septoria glumarum*) [*S. nodorum*: ibid., xx, p. 249; xxiii, p. 11] was unusually prevalent; the fungus appeared to be, to some extent at least, responsible for an appreciable amount of whiteheads.

About mid-April barley was attacked by *Marssonina graminicola* [*Rhynchosporium secalis*: ibid., xxiii, p. 89]. Severity of infection differed with the variety, and the symptoms generally disappeared following applications of nitrate, though on some varieties infection was intense and produced complete destruction of the foliage.

Potatoes were attacked by *Corticium vagum* [*C. solani*] during growth at the lenticels in the manner described by G. B. Ramsey in 1917 (*J. agric. Res.*, ix, pp. 421–426) [see also *R.A.M.*, xxi, p. 38]. The neighbouring parenchyma produced layers of corky tissue, accumulating to form pustules, which later became hollow and cylindrical, measuring 10 to 12 mm. long by 6 to 7 mm. in diameter. Tissue change generally remained quite local. Affected tubers should be eliminated.

Many complaints were received from growers of the prevalence on azaleas [*Rhododendron* spp.] of *Exobasidium azaleae* [*E. vaccinii*: ibid., ix, p. 389; xxiii, p. 346] and, particularly, of *Septoria azaleae* [ibid., xxi, p. 122]. In the vicinity of Namur

plum leaf spot and shot hole (*Ascospora beijerinckii*) [*Clasterosporium carpophilum*] appeared to be decreasing. Canadian poplars were commonly attacked by *Taphrina aurea* [ibid., xiv, p. 665] and *Dothichiza populea* [ibid., xxii, p. 183].

FAES (H.). **Station fédérale d'essais viticoles et arboricoles à Lausanne et Domaine de Pully. Rapports annuels 1943 et 1944.** [Annual reports for 1943 and 1944 of the Federal Viticultural and Arboricultural Experiment Station at Lausanne and Domaine de Pully.]—*Annu. agric. Suisse*, xlvi, 8, pp. 671–707, 1945.

Among other items of phytopathological interest in these reports [cf. *R.A.M.*, xxiii, p. 91] are the following. In co-operation with several other Swiss stations, further experiments were undertaken to determine the prospective value of copper-saving formulas for vine downy mildew [*Plasmopara viticola*] control. Satisfactory results were obtained with 1 and 1·5 per cent. Bordeaux mixture, 0·75 per cent. Bordeaux plus 0·4 per cent. magnesium sulphate, 0·3 per cent. Sandoz, 1 per cent. Bayer 2317 plus 0·1 per cent. copper Sandoz, and 1 per cent. Bayer 1192 A plus 0·2 per cent. copper Sandoz. Under conditions or in localities particularly favourable to the development of the pathogen, as in the canton of Ticino in 1944, it is advisable to raise the strength of Bordeaux to 1·5 and that of copper Sandoz to 0·4 per cent. after flowering for the protection of the grapes.

Applied in good time (12 hours at the latest after a hail shower), oxyquinoline (cryptonol or tumex) in liquid form gave promising results in the control of 'coître' (*Coniothyrium diplodiella*), but as a dust it was disappointing. Sprayed on the grapes as soon as possible after hail, a weak solution of pure copper sulphate (300 to 400 gm. per hectol. water) mitigates the injuries inflicted by the fungus to some extent. Field observations have shown the definite superiority, in respect of resistance to *C. diplodiella*, of hybrid bearers with their tougher leaves over Chasselas.

For the effective control of Oidium [*Uncinula necator*] the sulphur content of dusts should on no account be less than 40 per cent.

The abnormally dry and fairly hot summers of 1942, 1943, and 1944 were conducive to virulent outbreaks of 'roter Brenner' [*Pseudopeziza tracheiphila*: ibid., xx, p. 515], and the necessity for economy in the use of copper precluded effectual control measures, which should be instituted as soon as the shoots attain a length of 5 to 10 cm.

Apple scab (*Venturia*) [*inaequalis*] did not flourish under the weather conditions prevailing in the years covered by the reports, but mildew (*Podosphaera* [*leucotricha*]) occurred in a severe and persistent form on certain varieties. A spraying schedule of three successive applications, two before and one after the blossom, of lime-sulphur plus a wetter or wettable sulphur, gave moderately good control, but an entirely satisfactory programme has still to be drawn up.

Peach mildew (*Oidium*) [*Sphaerotheca pannosa*] has also been in evidence of late years; in Ticino encouraging results have been obtained in experiments with pomarsol.

Experiments were carried out on Monte Ceneri in the hope of finding a means to arrest the spread of chestnut ink disease [*Phytophthora cambivora*] and rehabilitate the less severely injured trees. A hopeful line of approach to the problem consisted in the exposure, before the onset of winter, of the root-collar and large roots over a radius of 8 to 10 m. to subject the pathogen to the influence of air and cold; the application to the exposed surfaces of a carbolineum solution; and two treatments, during the vegetative period, with a copper sulphate solution or copper dust.

Soil disinfection against fungal pathogens may be effected in the seed-bed by means of steam at 95° to 100° C.; 1 per cent. formalin, watered over well-prepared soil at a dosage of 8 to 10 l. per sq.m. at least a fortnight before sowing or planting;

and (on a small scale) dilute solutions of copper sulphate (0·5 to 1 per cent.) without lime, applied by watering immediately after sowing.

Miller (R. W. R.). **Annual Report, Department of Agriculture, Tanganyika Territory, 1944.**—8 pp., 1945.

On p. 7 of this report [cf. *R.A.M.*, xxiv, p. 8] it is stated that during 1944 wheat in the Northern Province of Tanganyika Territory was rather severely affected by *Puccinia graminis* and *P. glumarum*, the latter occurring at all elevations. Potato blight (*Phytophthora infestans*) was present at Kasulu, Western Province, and Mbeya, Southern Highlands Province; the disease has now been found in all the important potato-growing areas in the Territory. The bacterial ring rot of potatoes recently reported from Kenya [ibid., xxiv, p. 200] was observed in one field in the Usambara Mountains in a crop from imported seed. Tomato blight (*P. infestans*) was recorded. *Pythium aphanidermatum* was isolated from root rot, and *Phytophthora parasitica* from fruit rot, of papaws [ibid., xxiii, p. 235]. A sweet potato virus disease, which is also present in Uganda and the Belgian Congo [ibid., xxiv, p. 442], caused heavy loss in the Lake Province.

Rapport pour les exercices 1942 & 1943. [Report for the years 1942 and 1943.]—*Publ. Inst. nat. Étud. agron. Congo belge*, 154 pp., 1944.

In this report [cf. *R.A.M.*, xxiii, p. 431] it is stated (pp. 16–24) that the Stoneville cotton variety is not very susceptible to artificial infection with stigmatomycosis (*Nematospora coryli* and *N. gossypii*).

Further studies on the resistance of coffee varieties to *Colletotrichum coffeanum* [*Glomerella cingulata*: loc. cit.] indicated that of those tested L(ocal) B(ronze), L.B. 8, L.B. 9, L.B. 10, and L.B. 12 are the most resistant, while the Mysore lines are the most susceptible. Different Bordeaux treatments reduced infection by from 22 to 33 per cent.; the use of fungicides against *G. cingulata* is often disappointing, possibly because of the presence of latent infection in the fruits, floral buds, and hypocotyl. A species of *Cladosporium* destroyed the root cap of young *Cinchona* seedlings. *Fusarium* and *Verticillium* were isolated from *Cinchona* plants affected with tracheomycosis, but an unidentified organism successfully induced the symptoms of the disease on inoculation. *Armillaria* [*mellea*] caused much damage to *Cinchona* on land previously under forest.

Maize diseases so far identified at Gandajika include *Sclerospora maydis* [ibid., xxiii, p. 432], *Diplodia zeae* on the ears, *Puccinia sorghi*, *Physoderma zeae-maydis* [ibid., xiii, p. 691], and streak. *S. maydis* is the most serious parasite of maize locally, and the disease was widespread in 1942. Only resistant varieties should be planted. Maize streak is rather prevalent, but causes less important damage than *S. maydis*.

No resistance to groundnut rosette [loc. cit.] has been observed, and the only remedy is close planting.

Bean (*Phaseolus* sp.) cultivation is greatly handicapped by the presence of *Uromyces appendiculatus* [loc. cit.], though some native varieties appear to be immune.

Thomson (Betty F.). **Tissue responses to physiologically active substances.**—*Bot. Rev.*, xi, 10, pp. 593–610, 1945.

In this paper the author reviews and discusses the investigations conducted by a large number of workers since 1936 on tissue response in plants to physiologically active substances (such as indoleacetic acid, indolebutyric acid, and naphthalene acetic acid), the main points covered being their effect when applied to various plant parts, delayed tissue maturation due to their application, factors affecting tissue response, their relation to crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), and the mechanism of tissue response to them.

The evidence shows that the most consistent response of plant tissues to high concentrations of these substances is cellular proliferation. Crown gall causes abnormal growth resembling that induced by synthetic auxins. The precise relation of the presence of bacteria to the auxins apparently involved in gall development remains to be determined.

A bibliography of 66 titles is appended.

FRANDSEN (N. O.). **Septoria-Arten des Getreides und anderer Gräser in Dänemark.** [*Septoria* species of cereals and other grasses in Denmark.] — *Medd. Vet-Højsk. plantepat. Afd., Kbh.*, 26, 92 pp., 5 figs., 1943. [Received November, 1945.]

It is proposed provisionally to unite a small group of *Septoria* species with bacterioid, *Phyllosticta*-like conidia in a section, *Microseptoria*, within the genus. Three such species are described with the presumably associated macroconidial states, viz., *S. briosiana* Mor., which appears from a study of the relevant literature to be identical with *S. tritici* (*S. graminum*) [*R.A.M.*, xviii, p. 297], *S. gracilis* Passer., possibly representing a phase in the life-cycle of *S. phyllachoroides* Passer., and *S. brachypodina* O. Rostr. There is only one record of *S. nodorum* (on rye) for Denmark, and that is of doubtful authenticity; it occurs in the annual survey of plant diseases for 1923 by E. Gram and S. Rostrup [ibid., iii, p. 506]. The taxonomy, geographical distribution, symptomatology, host range, morphology, physiology, sources and modes of infection, pathogenicity, effects on individual host varieties, economic importance, and control of *S. tritici* and *S. nodorum* are discussed.

The examination of wheat leaves infected by *Ascochyta graminicola* on Fünen in 1930 [ibid., xi, p. 768] revealed conidia with average dimensions of 13 to 18 by 3 to 5 μ, accompanied by some much larger ones (20 to 25 by 5 to 6 μ) and a number of variable forms, including a few triseptate, 18 to 20 by 3 μ. The conidia of all other collections measured 18 to 20 by 4·5 to 6 μ and a third averaged 15 by 4 μ, with a range of 13 to 19 by 3·5 to 5 μ, and were very variable in shape. The same organism was collected on rye in 1941, and on barley in 1931. The writer regards the fungus as a collective species.

According to G. F. Weber, rye is susceptible to infection by *S. tritici* in the United States [ibid., ii, p. 212], but other records of the fungus on this host are of dubious authenticity. *S. secalis* [ibid., xv, p. 745] was collected on rye in Denmark in 1941; its geographical distribution, symptoms, host range, morphology, physiology, and effects are briefly described.

S. avenae [ibid., ii, p. 159 *et passim*] was obtained from oats in 1941. For many years past the fungus has been cited in Danish phytopathological literature as the agent of the so-called 'dark spot disease', but the writer finds no evidence of such a connexion and attributes the discoloration to physiogenic factors, the nature of which is as yet obscure. The desiccated spots produced by *S. avenae* are of a dirty yellowish-white colour, separated by a red-brown border from the surrounding yellowish-green tissue, which gradually merges into the normal. The perfect state of *S. avenae* was reported for the first time by Weber from Wisconsin [loc. cit.] under the name of *Leptosphaeria avenaria*. The fungus is probably of little economic importance.

The species described by Desmazières from France in 1847 (*Ann. Sci. nat.*, Sér. 3, viii, pp. 9-37) as a variety (c. *avenae*) of *S. graminum* was re-examined by Sprague in 1934 and considered to be a physiologic race of *S. tritici* [*R.A.M.*, xiii, p. 434], but the writer finds the grounds for both these attributions unconvincing and prefers to regard the fungus as an independent species, which he names *S. sativa* n.sp. (syn. *S. graminum* Desm. var. c. *avenae* Desm.). A Danish record of the organism (as *S. graminum*) by Rostrup (*Tidsskr. Planteavl*, vi, pp. 38-56, 1900) is thought to rest on a confusion with *S. avenae*.

A specimen of oats from E. Rostrup's herbarium labelled *S. avenae* (1898) also contained a hitherto undescribed *Phaeoseptoria*, to which the name of *P. multiseptata* n.sp. is assigned. It appears to occur invariably as a harmless saprophyte.

A fungus tentatively referred to *S. passerinii* Sacc. (*S. murina* Passer.) was observed on ripe barley plants in north Zealand, this being the first record for Denmark proper, though E. Rostrup's collection reported as *S. tritici* on the same host from the Faroe Islands (1901) may actually have been *S. passerinii*; material for identification is no longer available. The conidia of the Zealand species measure 3 μ in the original diagnosis, but otherwise the specimens are in satisfactory agreement with Weber's description [*R.A.M.*, ii, p. 356], according to which these organs are 1·7 to 3 (mean 2·3) μ in diameter.

E. Rostrup's two collections of *Agropyron acutum* (*A. junceum* × *A. repens*) and one of *A. obtusiusculum* are labelled as harbouring *S. graminum*, but the pycnidial dimensions (150 to 180 by 100 to 120 and 30 to 35, mean 35 by 1·5 μ, respectively), point rather to the identity of the specimen with *S. agrestis* Sacc. (*S. agropyri* Brun., nec. Ell. & Ev.). *S. phyllachoroides* was collected on *A. repens* in north Zealand in 1941.

A species on *Agrostis spica-venti* from Frederikshavn referred by E. Rostrup to *S. agrostidis* and by Lind (the original collector) to *S. bromi* is described by the author as *S. agrostidis* n.sp. It is characterized by spherical or oblong pycnidia, 70 to 170 by 50 to 100, mostly 130 by 90 μ, with brown, parenchymatous walls and an oval ostiole, 30 to 40 μ in diameter, filiform, straight or curved, hyaline, sometimes very indistinctly uni- or biseptate conidia, 30 to 55 by 1 to 1·5 μ. The fungus produces on the leaves and leaf sheaths oblong, ochraceous to brownish lesions supporting large clusters of pycnidia.

An active parasite of *Alopecurus agrestis*, collected by E. Rostrup in Lolland and identified as *S. graminum*, was later referred by Lind to *S. alopecuri* (Karst.) Syd., but the writer does not accept these determinations and names the fungus *S. alopecuri-agrestis*. The pale foliar lesions bear clusters of substomatal, subspherical or oblong pycnidia, 80 to 170 by 50 to 80 (mean 125 by 75) μ, with brown, parenchymatous walls and a subcircular ostiole, and the filiform, straight or curved, hyaline, often indistinctly septate conidia measure 33 to 50 by 1·5 to 2 μ. The species ascribed by Petrak and Esfandiari to *S. graminum* on *A. agrestis* in Persia [ibid., xxi, p. 99] is also believed to be *S. alopecuri-agrestis*.

E. Rostrup's and Lind's Danish collections labelled *S. avenaria* on *Ammophila avenaria* correspond with the original diagnosis of *S. avenaria* Rostr.

A Danish specimen determined by E. Rostrup as *S. graminum* on *Avena elatior* is thought to be identical with *S. bromi* Sacc. var. *arrhenatheri* Grove [ibid., xv, p. 53] on the same host, but as the writer's material differs from *S. bromi* and Grove gives no description of his variety, an independent species is erected as *S. arrhenatheri* (Grove pro var.) n.sp. The substomatal, oblong pycnidia, with brown, parenchymatous walls and an elongated ostiole surrounded by darker tissue, are disposed in long rows in pale, diffuse spots on the leaf sheaths and narrow, cinnamon-coloured stripes on the blades, and measure 75 to 140 by 55 to 90 (mean 110 by 70) μ, and the hyaline, bacterioid, mostly straight, usually uniseptate conidia are 25 to 35 by 1 μ.

Brachypodium silvaticum is a host of *S. tritici*, *S. brachypodina*, *S. brachypodiicola*, *S. brachypodii* Passer., and *S. silvatica* Passer. in Denmark.

Other species occurring on grasses in the country are *S. bromi* on *Bromus secalinus*, *S. calamagrostidis* on *Calamagrostis arundinacea*, *S. epigeios* on *C. epigeios*, *S. elymina* n.nom. (replacing *S. elymi* Rostr., a homonym of *S. elymi* Ell. & Ev.) and *S. elymicola* on *E. arenarius*, *S. festucae* on *Festuca gigantea*, *S. cavarai* n. nom. (*S. graminum* Desm. var. *lolii* Desm., *Ascochyta desmazierii* Cav.) on *Lolium perenne* (new to Denmark), *S. melicae* on *Melica uniflora*, *S. moliniae* on *Molinia*

coerulea, *S. annua* on *Poa annua*, and *S. oudemansii* on *P. nemorosa* (new to Denmark).

Among the *S.* spp. parasitizing grasses is a group with non-septate, half-moon- or boomerang-shaped conidia, several of which produce on the leaf blades and sheaths of their hosts sharply delimited eye spots. It is proposed to separate the representatives of this group from *Septoria* under the name *Lunospora* n.gen., with *L. oxyspora* (Penz. & Sacc.) n.comb. (*S. oxyspora* Penz. & Sacc.) on *Arundo donax* in Italy as the type species. Of the five other species already known, one (*L. culmifida* (Lind.) n.comb. (*S. culmifida* Lind.)) has been found on *Phleum pratense* and probably *P. nodosum* in Denmark. Two new species are described from Denmark, viz., *L. avenae* n.sp., characterized by substomatal, subspherical, brown-walled pycnidia, 40 to 120 by 40 to 70 μ, with a narrow, dark-bordered ostiole, hyaline, unicellular, obliquely half-moon-shaped conidia, 13 to 24 by 2·5 to 3·5 (15 to 17 by 3) μ, which forms on *Avena elatior* leaves small, oblong or rectangular, dirty white, ochraceous to brown- or purple-edged spots; and *L. baldingerae* n.sp., with pycnidia similar to the foregoing, 75 to 120 by 60 to 100 μ, and hyaline, unicellular, falcate conidia, 14 to 16 by 3 μ, the agent of oval or rectangular, grey, brown-edged lesions, 2 to 3 by 1 to 1·5 mm., on *Baldingera arundinacea*. It is further proposed to raise to specific rank, as *L. culmorum* (Grove pro var.) n.sp., *S. oxyspora* Penz. & Sacc. var. *culmorum* Grove on *Dactylis glomerata*, collected in Denmark in 1941.

Gråfläcksjuka. En av manganbrist orsakad växtsjukdom. [Grey speck disease. A plant disease caused by manganese deficiency.]—*Flygbl. Växtskyddsanst., Stockh.*, 75, 4 pp., 4 figs., 1945.

Popular notes are given on the symptoms, etiology, relation to environmental and cultural factors, and control of manganese deficiency disease of various Swedish crops [*R.A.M.*, xxiii, p. 243], including oats, barley, wheat, beets, and potatoes. The most resistant varieties of oats are Fyris, Klockhavre II, and Engelbrektshavre. Ordinary cases of manganese deficiency may be combated by the application to the soil of manganese sulphate at the rate of 50 kg. per ha., but on ground with an abundance of mould or lime in its composition, newly reclaimed marshland, or the drained bottom of a lake, where added manganese is liable to be fixed, the lacking element should be applied in the form of a 1 per cent. solution to the leaves at a dosage of 800 to 1,000 l. per ha. This very economical method of treatment consumes only 8 to 10 kg. manganese sulphate per ha. instead of 50, and may with advantage be used on other soils as well.

Yin (S. Y.). **Notes on physiologic specialization in Puccinia graminis tritici Erikks. and Henn. in China.**—*Phytopathology*, xxxv, 11, pp. 939–940, 1945.

Inoculations on the 12 standard wheat varieties used as differential hosts of *Puccinia graminis* [*R.A.M.*, ii, p. 158] with 175 collections of rust obtained in 12 provinces of China [ibid., xiii, p. 566] from 1942 to 1944 demonstrated the presence in the country, besides 12 physiologic races already known, viz., 10, 11, 15, 34, 39, 40, 95, 107, 115, 122, 143, and 189 [ibid., xxv, p. 30], of two new ones, provisionally designated C_1 and C_2. The former was first isolated from common wheat in Yunnan and then again from Khapli emmer in the nursery, and is distinguishable from all other known races by its infection types on Kota and Vernal (0 and 1++, respectively). It resembles 41 and 42 except on Kanred, which reacts by the 4++ instead of the 0 type of infection. It differs from 72 and 99 in its effects on Little Club and Arnautka. Race C_2 is similar to 122, except that the former produces type 3 and the latter type 1 infection on Vernal. Races 15, 107, and 122 were the most common, having been identified 35, 44, and 24 times, respectively, in the 175 collections, and 122 was the most widespread, occurring in nine of the twelve provinces visited.

Volosky Yadlin (Dora). **Identificación de razos fisiológicas del Puccinia graminis tritici y P. triticina, algunos estudios efectuados en Chile.** [Identification of physiologic races of *Puccinia graminis tritici* and *P. triticina*: some studies carried out in Chile.]—*Agric. tec., Chile* (formerly *Bol. Sanid. veg., Santiago*), v, 1, pp. 70–78, 1945. [English summary.]

In studies at the Department of Plant Breeding and Genetics, Santiago, of the Chilean physiologic races of *Puccinia graminis tritici* and *P. triticina*, Vallega's determination of the existence in Chile of races 11, 14, 15, and 17 of *P. graminis tritici* [*R.A.M.*, xxii, p. 424] has been confirmed. Of 42 varieties and selections of wheat from the United States, five remained entirely immune in inoculation experiments with a mixture of races in which the supervirulent 15 predominated, viz., Kenya 117 K–16–A, Kenya 117 E–B–I–16, Kenya 117 I–5–F, Red Egyptian, and McMurachy, while the remainder were more or less susceptible. The mode of perpetuation of *P. graminis tritici* in Chile is still unknown, and the importance of further studies on this critical aspect of the black rust problem is emphasized.

In addition to the races of *P. triticina* already recorded for Chile, namely, 15, 68, and 114, two new ones have been differentiated under the numbers of 71 and 85. No. 68 is the most widely distributed, having been isolated from samples in seven provinces.

Reitz (L. P.), Johnston (C. O.), & Anderson (K. L.). **New combinations of genes in Wheat × Wheatgrass hybrids.**—*Trans. Kans. Acad. Sci.*, xlviii, 2, pp. 151–159, 3 figs., 1945.

Of 33 plants derived from crosses between wheat and *Agropyron elongatum* (from Kansas) back-crossed once or twice to the fourth parent, eight were immune from leaf [brown] rust [*Puccinia triticina*] and all were resistant to stem [black] rust [*P. graminis*] in greenhouse inoculation tests in 1941.

Of 45 plants obtained from back-crossing hybrids between Mindum durum wheat and *A. trichophorum* (California) to the former parent, 37 were quasi-immune from *P. triticina* (physiologic race 9) and the remainder showed considerable resistance in 1944–5. Ten of the plants were quasi-immune from *P. graminis* (race 56), 18 highly resistant, 10 moderately so, 4 were susceptible, and 3 escaped infection. Similar reactions were displayed in 1941 by 22 plants resulting from crosses between wheat and *A. elongatum* obtained from Canada, while the neighbouring fields of common wheat were prematurely killed by excessive rust infection.

In another series of tests on three amphidiploid lines from Canada, viz., Vernal emmer × *A. glaucum*, C.I. 12348, *Triticum turgidum* (49) × *A. glaucum* (1087), C.I. 12349, and Kharkof × *A. glaucum*, C.I. 12351, with races 5, 9, 15, 44, and 126 of *P. triticina*, all the plants were quasi-immune except a few of C.I. 12348, which showed only moderate resistance to race 15. Plants from nine kernels resulting from back-crosses of selection S 4–207 to common winter wheat were grown in the greenhouse in 1945 and found to be virtually immune from race 9 of *P. triticina*, while two reacted similarly to race 56 of *P. graminis* and seven were highly resistant.

In a final series of trials in 1945 on 22 plants of two lines of a cross between wheat and *A. elongatum* (California), all were nearly immune from race 9 of *P. triticina*, while in the case of *P. graminis* (race 56), 7 were quasi-immune, 8 highly, and 8 moderately resistant.

Bonnett (O. T.), Woodworth (C. M.), Dungan (G. H.), & Koehler (B.). **Prairie : a new soft winter Wheat in Illinois.**—*Bull. Ill. agric. Exp. Sta.* 513, pp. 595–600, 2 figs., 1945.

The new soft red winter wheat, Prairie, is resistant to wheat mosaic [*R.A.M.*, xxiv, p. 496], and highly resistant to the physiologic races of black rust [*Puccinia*

graminis] commonly found in Illinois. It is susceptible to leaf [brown] rust [*P. triticina*], loose smut [*Ustilago tritici*], and bunt [*Tilletia foetida*].

Although the Prairie seed distributed to foundation seed-growers in the autumn of 1943 was one year removed from the hot water treated seed, the 1944 crop showed only traces of loose smut. Where infected fields are present, the seed fields of Prairie should be planted to windward of them, or at least 40 rods away. With this precaution Prairie fields should remain almost unaffected. Even if no special precautions are taken against spread, three to five crops can be grown before infection causes much reduction in yield, provided smut-free seed was used at the start. When the head count of a field of Prairie shows 10 per cent. or more loose smut, the seed should be changed.

VANDERWALLE (R.). **Note sur la biologie d'Ustilago nuda tritici Schaf.** [A note on the biology of *Ustilago nuda tritici* Schaf.]—*Bull. Inst. agron. Gembloux*, xi, 1–4, pp. 103–113, 3 figs., 1942. [Flemish, German, and English summaries. Received January, 1946.]

In a study of the mechanism of varietal resistance of different lines of wheat to floral infection by *Ustilago nuda tritici* [*U. tritici*: *R.A.M.*, xx, p. 55], the author made a detailed investigation of mycelial penetration in susceptible and resistant varieties.

It was found that the chlamydospores of the fungus germinate rapidly on the exudate covering the stigmas of both the susceptible and resistant varieties. After some days numerous points of penetration are observed on a level with the thin plumular ramifications of the style. Desiccation of the fine terminal ramifications of the plumules favouring penetration, the mycelium was then detected at the top of the ovary, and was seen to invade progressively all the cells of the outer coverings of the ovary, i.e., the testa. Ten days to a fortnight after infection, the mycelium was clearly visible in the epidermal tissue of the ovary and towards the bottom third. Its presence in this part of the flower does not seem to be due to spread from the top, because between the upper and lower parts of the ovary there is a zone in which the fungus is not present. The marked development of the hyphae at the base of the ovary suggests points of penetration here, and in one instance, penetration appeared to be well established. In the wall of the ovary the hyphae were of rather variable diameter, and progressed in a sinuous but centripetal direction. The mycelium is entirely intercellular and insinuates itself between the host cells by pressure on the cell walls, which thus become detached from the middle lamella; a space is produced and filled with mycelium, forming swellings. Experimental evidence indicated that vegetative transmission of the fungus probably occurs. The density of the mycelium in the embryo probably results from the numerous points of penetration.

A comparative study of experimentally infected embryos from the seeds of susceptible and resistant varieties showed that the embryo of the latter alone was unaffected, so that it is only at this level that an effect of resistance is present. The mycelium disappears in the coverings of the ovary and recurs again there in the mature seed.

As regards the degree of floral infection, the conditions in which infection takes place appear to be much more important than loss of virulence by the mycelium in the seed. Taking slips at the first node failed to eliminate the fungus. Of others made, starting from the second node, some lived and showed no smutted ears at harvest. This seems to show that the mycelium in the vegetative point of the embryo develops rapidly at germination but gradually loses ground with respect to host development and becomes outdistanced, reaching the top of the stem again only when the primordia of the floral organs become differentiated.

No correlation was established between the presence of the fungus in the seed and the germinative energy of the latter. The vitality of the mycelium is very

high and seems to remain quite unaffected even by treatment of the seed with different light rays, colchicin, acenaphthene, and phenylurethane.

Oort (A. J. P.). **Onderzoekingen over stuifbrand II. Overgevoeligheid van Tarwe voor stuifbrand (Ustilago tritici).** [Studies on loose smut II. Hypersensitivity of Wheat to loose smut (*Ustilago tritici*).] – *Tijdschr. PlZiekt.*, l, pp. 73–106, 6 pl., 1 fig., 4 graphs, 1944. [English summary.]

For the study of physiologic specialization in wheat loose smut (*Ustilago tritici*) [*R.A.M.*, xxv, p. 30] 28 spring varieties were inoculated with ten collections of the fungus originating in several countries. In 15 varieties certainly, and in six probably, symptoms of hypersensitiveness were induced by four out of the ten collections, representing three out of six physiologic races (race 1 from Juliana and also from Van Hoek, Holland, race 3 from Peragis 8057, Germany, and race 6 from Peragis selection 368 20, Germany). The most conspicuous feature was marked inhibition of growth, expressed by shortening of the first three leaves, sometimes accompanied by chlorotic striping and spotting and foliar curling. Many plants showing these symptoms (which assume prominence only under greenhouse conditions) die in the two- or three-leaf stage, while the survivors slowly recover, either by means of new growth from the main axis or the development of lateral shoots. Such plants remain small and produce little if any grain, but they are almost invariably free from smut. In the field hypersensitive individuals fail to emerge or make scanty growth, leaving gaps in the stand for which the tillering of the remaining healthy plants only partly compensates. The definitely hypersensitive varieties were v. Rümkers Dickkopf, Picardie, Atle, Kota, Sully, Ceres, Little Club, Van Hoek, Thew, Reward, Vilmorin 29, Renfrew, and Florence × Aurore.

Although no direct evidence is forthcoming that the stunting phenomenon results from infection by *U. tritici*, the existence of a correlation may safely be assumed on the grounds of (*a*) the high degree of specificity referred to above, and (*b*) the development in certain varieties, e.g., Ceres, of small, smutted ears, especially after inoculation with collection C (race 1) from Van Hoek. Hypersensitiveness of such a severe degree appears to be almost unprecedented in the history of phytopathology, except possibly in the case of certain potato viruses [ibid., xviii, p. 756], though Thren's observations on physiologic specialization in barley loose smut (*U. nuda*) described in *Phytopath. Z.*, xiii, pp. 539–571, 1941, may be considered to point in the same direction.

Two different principles are evidently involved in the relationship of host to parasite, namely, (1) susceptibility or non-susceptibility, determining whether the plant will be attacked, and if so, to what extent, and (2) hypersensitiveness or non-hypersensitiveness, determining whether the host will show the hypersensitive reaction or produce smutted ears: plants are, therefore, either (1) resistant, (2) susceptible and non-hypersensitive, or (3) susceptible and hypersensitive. For practical purposes the term 'hypersensitive' may be replaced by 'field-resistant'. Proof of this hypothesis is afforded by the facts that (1) races 1 and 3 induce hypersensitiveness in certain varietal groups which react to 2 and 4 by susceptibility only; (2) the incidence of infection, generally speaking, is the same for all six races, irrespective of whether the varieties react with susceptibility or with hypersensitiveness; and (3) the temperature prevailing during the ripening of the seed exerts a strong influence on the extent both of hypersensitiveness and susceptibility (of which only the former is discussed in this paper); in Fylgia inoculated with the Van Hoek isolate (race 1), for instance, the incidence of hypersensitiveness was about three times as high at 24° as at 13° C.

An attempt was made to explain the different varietal reactions on the basis of genetic factors. Two sets of specific factors for resistance, S_1S_1 and S_2S_2 in the

plant are assumed to interfere with complementary sets of factors in the parasite $\Sigma_1\Sigma_1$ and $\Sigma_2\Sigma_2$. A variety is resistant when a set of *S*-factors coincides with a corresponding one of Σ factors, i.e., $S_1S_1+\Sigma_1\Sigma_1$ or $S_2S_2+\Sigma_2\Sigma_2$: in all other cases it is susceptible. Sets of specific factors for hypersensitiveness must also be assumed both in the plant (G_1G_1 and G_2G_2) and pathogen ($\Gamma_1\Gamma_1$ and $\Gamma_2\Gamma_2$). A variety is hypersensitive when a set of *G*-factors corresponds with one of Γ-factors, i.e., $G_1G_1+\Gamma_1\Gamma_1$ and $G_2G_2+\Gamma_2\Gamma_2$.

Livingston (J. E.). **Important diseases of Corn in Nebraska.**—*Ext. Circ. Neb. Coll. Agric.* 1804, 8 pp., 7 col. figs., 1945.

Notes are given on the symptoms and control of the following maize diseases in Nebraska; dry rot (*Diplodia zeae*), pink rot (*Gibberella fujikuroi*), ear rot (*G. zeae*), cob rot (*Nigrospora sphaerica*), *Diplodia* stalk rot (*D. zeae*), charcoal root and stalk rot (*Macrophomina phaseoli*), and smut (*Ustilago maydis*).

Smith (C. O.) & Klotz (L. J.). **A more virulent black pit organism on Citrus.**—*Phytopathology*, xxxv, 11, pp. 942–943, 1 fig., 1945.

A similar account of this work on black pit of Citrus caused by *Phytomonas* [*Pseudomonas*] *syringae* has already been noticed from another source [*R.A.M.*, xxiv, p. 446].

Schultz (E. F.). **Algunas observaciones sobre la podredumbre de las racillas del Naranjo agrio injertado.** [Some observations on the root rot of the grafted bitter Orange.]—*Bol. Estac. exp. agríc. Tucumán* 54, 22 pp., 8 figs., 1945.

The available information concerning bitter orange root rot ('tristeza') [*R.A.M.*, xxv, p. 111] is fully summarized and discussed, with special reference to its occurrence in the provinces of Tucumán, Salta, and Jujuy, Argentina.

Thirumalachar (M. J.). **Bud rot of Areca Palms in Mysore.** —*Nature, Lond.*, clvii, 3978, pp. 106–107, 1946.

Detailed microscopic examination of the affected parts of *Areca* palms in Mysore showing the condition known locally as 'hidimundige' [*R.A.M.*, xvii, p. 295] or thinning-out of the crown, in which the leaves are gradually shed and the entire crown slips out, revealed the presence of such large numbers of an unidentified species of *Aphelenchus*, that the parasitism of the nematode was beyond doubt. In a general way the organism resembled *A. cocophilus*, the cause of coconut red ring in the West Indies [ibid., iv, p. 724; ix, p. 714].

Notini (G.), Mathlein (R.), & Lihnell (D.). **Grönmykos förorsakad av Metarrhizium anisopliae (Metsch.) Sorok. I. Grönmykosen som biologiskt insektbekämpningsmedel. II. Fysiologiska undersökningar över grönmykosens svamp.** [Green mycosis caused by *Metarrhizium anisopliae* (Metsch.) Sorok. I. Green mycoses as a biological means of insect control. II. Physiological investigations on the green mycosis fungus.]—*Medd. Växtskyddsanst., Stockh.*, 43, 90 pp., 23 figs., 1 diag., 7 graphs, 1944. [English summaries.]

Part I of this study is contributed by G. Notini and R. Mathlein and part II by D. Lihnell. That conidial germination in *Metarrhizium anisopliae* [*R.A.M.*, xxii, p. 96] is initiated by a stimulus from the fat layer of the chitinous integument of insects was demonstrated by the results of staining and other tests. Hyphal penetration through the chitin is effected with the aid of chitinase, the rate of the process being influenced by the structure and age of the chitin and the activity of the leucocytes below the mother cells of the integument. Hyphal development within the host is characterized by a pronounced affinity for the adipose tissue.

Mortality among insects parasitized by *M. anisopliae* is attributable to the toxic properties of the hyphae.

The following pests were more or less effectively combated in inoculation tests of varying extent with the muscadine fungus: *Sphinx pinastri*, *Dasychira pudibunda*, *Lymantria dispar*, *Agrotis segetum*, *A. nigricans*, *A. tritici*, *Rhyacia pronuba*, *Barathra brassicae*, *Polia oleracea*, *P. pisi*, *Cerapteryx graminis*, *Galleria mellonella*, *Ephestia kühniella*, *Tortrix paleana*, *T. viridana*, *Cossus cossus*, *Tinea secalella*, *Blastodacna putripennella*, *Hoffmanophila pseudospretella*, *Argyresthia conjugella*, *Contarinia tritici*, *C. pyrivora*, *C. leguminicola*, *Melolontha hippocastani*, and *Serica brunnea*. As regards the grain-moth (*T. secalella*) trials, further investigations are requisite to determine the practical utility of this mode of control, but the 40 per cent. mortality in a warehouse in which the walls, floor, &c., were sprayed with water and then dusted with conidia, is regarded as fairly promising for a preliminary test. Eleven other species were moderately susceptible to *M. anisopliae*, while a number of other insects tested proved to be immune.

The outlook for the practical application of the muscadine fungus to the extermination of susceptible insect pests is considered to be favourable for the following reasons. Inoculum is easily prepared in bulk from the conidia and disseminated either as an aqueous suspension with the admixture of 0·5 per cent. soft soap or in combination with dry inert fillers, e.g., fine silt, sand, diatomaceous earth, and talc; the conidia are capable of withstanding intense cold and abrupt temperature fluctuations; and the fungus is a well-marked facultative parasite, able to adjust itself to a saprophytic mode of existence.

The influence of the hydrogen-ion concentration of the medium on *M. anisopliae* was studied in a series of buffer nutrient solutions with α-alanin as a source of nitrogen. The mycelial growth curves were fairly level, with a slight peak round about P_H 7, these observations being confirmed in the main by estimates of the dry weight. Conidial production took place in all the cultures at and upwards of P_H 4. The minimum, optimum, and maximum temperatures for the development of the fungus on malt agar were 10°, 25° to 30°, and 32° to 34° C., respectively, conidia being formed throughout the range from 15° to 32° in quantities corresponding to the luxuriance of the mycelium.

About 30 sources of carbon, including the purified chitin of *Cossus cossus* and *Melolontha hippocastani*, were tested for their acceptability to *Metarrhizium anisopliae*. Glucose, sucrose, glycerol, peptone, and gelatine were most extensively utilized. Asparagin was a superior source of nitrogen to ammonium nitrate in the promotion of conidial production, but α-alanin, urea, peptone, and gelatine also provided an active stimulus to growth, particularly the series in which carbon was furnished by glycerine in place of glucose. Although *M. anisopliae* is autotrophic on a purely synthetic nutrient solution, the addition of a small amount (0·2 per cent.) of yeast extract resulted in modest but definite increases in mycelial weight and conidial production. On the other hand, a dilute extract of body fluid from *C. cossus* larvae exerted a stimulus comparable to that afforded by yeast extract.

Van Slogteren (E.) & De Bruyn Ouboter (Maria P.). **Onderzoekingen over virus-ziekten in bloembolgewassen. I. Narcissen. I.** [Studies on virus diseases in flowering bulb crops. I. Narcissi. I.]—*Meded. LandbHoogesch., Wageningen*, xlv, 3, 32 pp., 31 figs. (4 col.), 1 diag., 1941. [German summary.]

The following are among the conclusions drawn from the author's extensive studies, covering a period of four years, on some outstanding problems in connexion with the narcissus mosaic virus on daffodils (*Narcissus* [*pseudo-narcissus*]) and other narcissi in Holland [*R.A.M.*, xix, p. 21]. Artificial infection experiments are more successful when undertaken early in the season. In 1937, for instance, 84 Sir

Watkin daffodil plants were inoculated with juice from diseased individuals of the same variety on eight different dates between 3rd March and 2nd June, inclusive, and in 1938 the resulting percentages of infection on the 27 reacting positively were 20, 46·6, 50, 26·6, and 80 for the series of 18th and 31st March and 8th, 14th, and 22nd April, while negative results were obtained in those of 3rd March, 29th April, and 2nd June. None of the 400 controls developed any symptoms. In another series of tests on 352 daffodils covering a longer period (23rd and 24th March to 13th and 14th July) in 1939–40, 100 per cent. infection developed in the plants inoculated on 13th April, the corresponding figures for 23rd, 24th, and 31st March, 7th, 8th, 21st and 28th April, 3rd, 9th, 16th, 18th and 19th, and 24th and 26th May, 31st May and 1st June, and 7th and 8th June being 95, 70, 85, 30, 30, 20, 40, 30, 5, 5, and 5, respectively, while from 12th and 13th June to 12th and 13th July only negative results were secured. The 31st March, 21st and 28th April, and 16th, 18th, and 19th May series of tests further yielded 20, 20, 5, and 5 per cent. doubtfully positive results, respectively. The 193 controls planted in the same field remained completely healthy, as also did the mother batch of some 18,000 plants from which the test specimens were taken.

In another trial young field plants of Sir Watkin were inoculated on 8th and 9th, 14th and 15th, 23rd and 31st March, and 5th and 12th April, 1939, with juice from dried plants in varying stages of maturity from the end of flowering to the dying-off of the foliage, with 90, 100, 50, 83·3, 100, and 20 per cent. positive results, respectively, the 23rd and 31st March tests also eliciting 6·25 and 8·3 per cent. doubtful responses, respectively. From the combined outcome of this and the foregoing experiment it may be inferred that the stage of growth of the host is a more important factor in the success of inoculation tests than that of the plant providing the inoculum.

Other tests were carried out to determine the influence on the development of mosaic of the amount of infective material introduced into the host. Thus, on 22nd April, 1937, 8 to 10 leaves of each of ten plants were inoculated in one lot, and all those of another ten, with resultant positive percentages in 1938 of 20 and 80, respectively. Again, between 17th April and 22nd May, 1939, three leaves of each of 52 plants were inoculated in one batch and all those of another 52, the positive percentages in 1940 being 7·7 and 37·7, respectively, with 1·7 doubtful in the latter.

McWhorter inclined to the opinion that infection was spread by means of root contact [ibid., xi, p. 579], but the writer's experiments do not support this view. Thus in 1938, 25 diseased and 25 sound bulbs of the Mrs. A. Krelage variety were arranged in three plots permitting of (A) contact both under and above ground, (B) above ground only, and (C) underground only, with resultant percentages of diseased plants in 1939 of 24, 20 (and 4 doubtful), and 0 (and 4 doubtful), respectively. A similar test was carried out with twice the number of Sir Watkins in 1939, in which the positive percentages in 1940 in plots (A), (B), and (C) were 16 (and 2 doubtful), 6 (and 2 doubtful), and 0, respectively. The fact that plants grown in frames under conditions precluding insect infestation remained healthy, whereas those exposed to this danger in the field contracted severe infection, was considered to point to the implication of an aphid in the transmission of the virus, and a footnote states that proof has since been obtained of the great activity in this respect of *Aulacorthum* [*Macrosiphum*] *solani* and of the lesser part played in the spread of mosaic by *Doralis* [*Aphis*] *fabae* and *M. euphorbiae* [*M. solanifolii*; cf. ibid., xx, p. 206].

Another experiment was undertaken to determine the influence of proximity to diseased plants on the development of mosaic in healthy ones with the following results. Of 116 Minister Talma bulbs surrounded by healthy neighbours, 5·2 per cent. became diseased, compared with 12·7 per cent. of the same number interplanted with at least one infected individual. No infection developed in two lots

of Sir Watkin adjacent to diseased plants, while in three of Dubbel van Sion the resulting mosaic percentages were as follows: of 3,330 interplanted with sound bulbs, 1·8, and of 970 with at least one sick neighbour, 7·2; of 138 with the adjacent bulbs all sound, 0; and of 70 with at least one diseased in the vicinity, 4·3; of 116 planted near healthy bulbs, 9·4, and of 112 in proximity to many diseased ones, 36. In conjunction with this test, the effect of the date of lifting the bulbs on the spread of the virus was investigated. Of 100 Sir Watkins selected as healthy in the spring of 1936, surrounded by virus-free neighbours and lifted early, none of the 205 bulbs planted in the autumn gave rise to diseased plants in 1937, compared with 1·4 per cent. infection in the progeny of 217, also originating from healthy plants with sound neighbours but dug at the normal time. In another batch of Sir Watkins, 174 bulbs from 100 healthy plants surrounded by many diseased ones and lifted early produced 3 per cent. mosaic offspring, the corresponding figure for 188 bulbs from 100 sound plants with diseased neighbours dug at the normal time being 13. In another test 1,055 bulbs planted in the autumn of 1938 from 500 Sir Watkins selected as healthy in the previous spring, surrounded by numerous infected plants and lifted early (22nd June), gave rise to 40·6 per cent. diseased progeny, while the corresponding figure for 1,072 bulbs from 500 healthy plants intermingled with diseased ones and dug at the normal time (28th July) was 50·9.

From a table giving the results of intervarietal cross-inoculation experiments on a number of well-known daffodils, and the figures illustrating the symptoms thus induced, it is evident that a single virus may be responsible for a great diversity of pathological manifestations. Hence it is concluded that the reaction to infection is an attribute of the individual plant and not of the host providing the inoculum. Further weight was lent to this hypothesis by the outcome of serological experiments.

Various symptom complexes are described and figured, which are presumably of virus origin, but have not yet been positively determined by inoculation experiments.

Control should consist in the timely inspection (at the opening of the growing season) of all daffodil fields and the prompt removal of all plants suspected of harbouring the mosaic virus.

McClellan (W. D.). **Pathogenicity of the vascular Fusarium of Gladiolus to some additional Iridaceous plants.**—*Phytopathology*, xxxv, 11, pp. 921–930, 3 figs., 1945.

A full account is given of inoculation experiments demonstrating the pathogenicity of *Fusarium orthoceras* var. *gladioli* [*R.A.M.*, xxiii, p. 345] to *Babiana* hybrids, mixed spring-flowering *Crocus*, *Freesia* seedlings, *Homeria collina*, bulbous *Iris* of the Imperator, Poggenboek, and Wedgewood varieties, *Ixia* hybrids (Bloem Erf, Dutch, and Mrs. Cleveland's), assorted *Sparaxis*, *Streptanthera cuprea*, *Tritonia crocata* seedlings, and assorted *Watsonia*. A fungus similar to *F. orthoceras* var. *gladioli* isolated from *Iris* was innocuous to the Picardy and Dr. F. E. Bennett *Gladiolus* varieties.

Rosen (H. R.). **Search for black-spot resistance in Roses.**—*Amer. Rose Annu., 1944*, pp. 155–159, 1944.

This is a report of the progress to date in the development of resistance to rose black spot [*Diplocarpon rosae*] in the United States [see next abstracts]. A definite landmark in breeding for this purpose is represented by the everblooming bush variety Pink Princess, produced by Brownells from a cross between (Dr. W. van Fleet × Gen. Jacqueminot) × Break o' Day, the latter a hybrid of Seedling × Glenn Dale. The new variety appears to be the first to possess true resistance to the fungus, as opposed to mere escape from infection under the influence of favourable climatic and environmental conditions.

Smith (A. G.). **Lime and fertilizers in relation to blackspot of Roses.**—*Bull. Va agric. Exp. Sta.* 368, 10 pp., 1945.

Following the claim made by C. Mallerin (*Annu. Amer. Rose Soc.*, xxiii, pp. 149–152, 1938) that he had controlled rose black spot (*Diplocarpon rosae*) [*R.A.M.*, xxiv, p. 103] through using a fertilizer containing nitrogen, phosphoric acid, and potash in a ratio of 1 : 2·5 : 3·5 (i.e., 36, 90, and 126 lb. per acre) together with fungicidal sprays, an experiment was begun in 1937 at Blacksburg, Virginia, in which Mallerin's fertilizer mixture was used as a basis of study, with potash treatments below and above this level, Mallerin having attributed his success mainly to the amount of potash applied. As most of the plots gave a P_H reading much below the figure (7·5) recommended by Mallerin, lime was added to two series to raise the P_H one unit, while in two others this amount was doubled.

The data obtained showed that lime had no effect on the number of leaves infected with black spot. In 1939 and again in 1940 there was no significant difference in the number of affected leaves between the plots receiving Mallerin's fertilizer and those on which a different fertilizer mixture was used. In 1941 (the most abnormal season for roses in six years, locally), there was a significant reduction in the number of black-spot leaves in the plots where a fertilizer high in potash was used, but the reason for this is not clear. On the other hand, there was a significant difference in varietal behaviour towards the disease, Étoile de Hollande (with 16·4 per cent. of the leaves infected) being most resistant, followed in descending order by Dickson's Red, McGredy's Sunset, World's Fair, Rome Glory, and Alice Harding (44 per cent.).

It is concluded that the degree of resistance to black spot shown by a given rose variety appears to be a more important factor in control than an excessive use of potash as a fertilizer.

Lyle (E. W.). **Understocks and black-spot. Four Rose understocks and their effect on the occurrence of black-spot and growth of bushes.**—*Amer. Rose Annu., 1944*, pp. 160–162, 1944.

The effects of four kinds of understocks on the development of rose black spot (*Diplocarpon rosae*) [see preceding abstracts] in susceptible Caledonia scions were observed at the Texas Agricultural Experiment Station [*R.A.M.*, xxiv, p. 104]. Budding was effected between 18th July and 29th August, 1941, and the understock tops were cut off on 17th March, 1942. On 5th May following, the percentages of diseased plants on Welch Multiflora, Tate Multiflora, *Rosa manetti*, and Texas Wax were 20·7, 36·7, 76·5, and 36·5, respectively, and the percentages of spotted leaflets on 28th July 25·7, 21·8, 24·5, and 21·2, respectively. Despite the general increase in black spot with the advance of the season, there were significant differences at harvest time in favour of the two Multiflora stocks as regards the size and quality of the bushes. The weekly application of sulphur-copper dust increased the percentage of bushes grading No. 1½ and upwards from 52 to 89, and the weight per ten bushes from 2·29 to 3·62 lb.

Munro (Moira C. D.). **A root rot of Cineraria and a study of the species of Phytophthora concerned.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 115–126, 1945.

Cinerarias grown as pot plants in Ayrshire nurseries suffer from a root rot and wilt, affecting plants at all stages of growth but especially seedlings and plants just ready to flower. The first symptom is a tendency to wilt, which appears suddenly, the lower leaves being affected first, although still retaining their green colour; later the young leaves droop. In severe attacks shading and watering failed

to produce any recovery. Wilted plants showed a pinkish discoloration of the roots which in advanced stages were brown, exhibiting a soft, odourless rot. The cortex sloughed easily on pulling the root from the soil and rotting of the xylem and pith was frequently present in the crown.

Fungi isolated from roots showing pinkish discoloration of the stele included *Fusarium* and *Ascochyta* spp., but usually the only growth was a Phycomycetous fungus resembling *Pythium* or *Phytophthora*; the presence in some cases of amphigynous oogonia, and the tendency to release zoospores directly from the sporangium with no external vesicle, suggested the latter genus. The ease and frequency of these *Phytophthora* isolations indicated that these isolates were the pathogens. Artificial inoculations of healthy plants produced 64 per cent. root-rot infection, the disease usually becoming apparent in four weeks. Roots from these plants again yielded *Phytophthora* cultures.

Detailed studies of the isolates resulted in most of them being identified as *P. cinnamomi*; inoculations with these isolates produced the most rapid rotting, and this species is believed to be responsible in the greatest measure for the disease. *P. cambivora* was also identified among the isolates, and though parasitic, was found to be much less virulent than *P. cinnamomi*.

Hughes (S. J.). **Studies on some diseases of Sainfoin (Onobrychis sativa). I. Ring-spot caused by Pleospora herbarum (Pers.) Rabenh.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 86–90, 1 pl., 3 figs., 1945.

Of 17 fungi listed by Oudemans (Enum. syst. fung., iii, p. 944, 1921) on sainfoin (*Onobrychis sativa*), only three induce disease in Britain, viz., leaf spot (*Ascochyta orobi*), rust (*Uromyces onobrychidis*), and mildew (*Erysiphe polygoni*). Two diseases not mentioned by Oudemans are chocolate spot (*Botrytis cinerea*), observed in Glamorgan to kill flower buds and cause a stem rot under very moist conditions, and rot caused by *Sclerotinia trifoliorum* [*R.A.M.*, xx, p. 72]. A leaf spot of sainfoin caused by *Ramularia onobrychidis* was found by the author in December, 1942.

Ring spot (*Pleospora herbarum*, stat. conid. *Stemphylium botryosum*) is always present throughout the year on sainfoin in Glamorgan and is most abundant in the spring; it was common at all stations in April, 1944. The spot consists of a circular, light brown area with a darker, well-defined margin. Young lesions are entirely dark brown but the central zone becomes lighter as infection spreads. Abundant conidia are produced in favourable conditions of moisture and give the spot a conspicuous sooty appearance. The fungus also thrives on dead leaves and sainfoin stems. Infected leaflets wither and fall, particularly in spring when the pathogen is most active, but generally speaking no significant loss is caused to crops. The spots closely resemble those caused by *A. orobi*.

Sainfoin leaves were sprayed with a suspension of conidia and loopfuls of an ascospore suspension were placed on the leaflets. In an atmosphere only slightly moist germ-tubes entered the leaf through the stomata, but it is possible that cuticular penetration also takes place. Once within the substomatal cavity, the hypha widens and soon branches out intracellularly through the leaf tissues [cf. ibid., xx, p. 306]. Hyphae penetrate the epidermal cells from below and finally make their way between the epidermal cells and cuticle. Proliferation occurs and subcuticular stromatic cushions are formed, from which develop tufts of conidiophores bearing conidia [ibid., xviii, p. 141].

Perithecia of *P. herbarum* were formed in monoconidial cultures exposed to light and were found on dead sainfoin stems in 1942 before any leaf-spotting was observed, their mean ascospore measurements being 34 by 16 μ in nature and 35 by 16 μ in culture, while conidial measurements were 36 by 17 μ in nature and 32 by 17 μ in culture.

Christoff [Khristov] (A.). Опредѣляне на жизнеспособностьа чрезъ оцвѣтяване съ Nile blue sulfate. [Differential staining by the aid of the Nile blue sulphate.]—*Спис. Земед.-Опит. Инсти България.* [*J. agric. Exp. Stas Bulgaria*], xi, 4, pp. 13–15, 1941. [English summary. Received December, 1945.]

Differential staining of living and dead sclerotia of *Sclerotinia trifoliorum* has been obtained by soaking the cut sclerotia in 0·2 per cent. Nile blue sulphate in water for five minutes, washing or drying to remove excess stain, and then placing them in 0·025 per cent. potassium hydroxide. The dead sclerotia were stained blue or bluish-green, the living red. Similar differentiation also occurs in the mycelium of *S. trifoliorum*, as well as in mycelium and sclerotia of *S. sclerotiorum*. On the other hand, an opposite result was obtained with *Ophiobolus graminis*, the dead mycelium staining red and the living blue; in this case differentiation was carried out in 0·1 per cent. potassium hydroxide solution.

Strips obtained from the epidermis of tobacco and tomato plants infected with severe-etch virus showed that cells without chlorophyll became red, and the amorphous and crystalline virus inclusions blue.

Christoff [Khristov] (A.). Развитие и кълнение на склероцитѣ на Sclerotinia trifoliorum Erikkson. [Development and germination of *Sclerotinia trifoliorum* Eriksson.]—*Год. Унив. София, Агрон.-Лес. Фак.* [*Yearb. Univ. Sofia, Fac. Agric.*], xx, pp. 86–87, 3 figs., 1941–42. [English summary. Received December, 1945.]

In the course of these experiments, based on studies at Rothamsted in 1940, nitrates and urea (used at under 0·3 per cent.) were shown to promote the development of the sclerotia of *Sclerotinia trifoliorum* [*R.A.M.*, xviii, p. 628; xxiii, p. 22], contrary to Pape's findings [ibid., xvii, p. 252]. The viability of the sclerotia decreases with increased depth of burial in the soil and higher water content in the soil. Sclerotia submerged in water survived for 26 days and then decayed completely, but retained their germination capacity for 22 months when kept dry in the laboratory. Germination of the sclerotia was seen to depend on the composition of the media on which they developed, the degree of their maturity, soil texture, temperature, moisture, and reaction, and light. Light delays sclerotial development, but is indispensable to the development of the apothecia, and red, blue, and yellow light favoured germination. The optimum temperature for sclerotial germination was about 16° C., good results being obtained between 10° and 20°. Germination is satisfactory within a wide range of P_H, with the optimum on the alkaline side. Light, well-aerated soils are best for germination, but not at depths below 1 to 2 cm. [cf. ibid., xxv, p. 44]. Potassium sulphate favours germination, but other fertilizers, particularly urea, inhibit it, sometimes completely. Re-germination of mature sclerotia is possible under favourable conditions.

Thirumalachar (M. J.). **Ergot on Pennisetum hohenackeri Hochst.**—*Nature, Lond.*, clvi, 3973, p. 754, 1945.

The ergot and sphacelial stages of a species of *Claviceps* were collected on *Pennisetum hohenackeri* [cf. *R.A.M.*, xxv, p. 36] near Bangalore in February and March, 1945. Mature sclerotia germinated in sterilized moist sand after 20 to 30 days, the first indication being the rupture of the cortex and the extrusion of a white, globose head. When mature the ascigerous head was maroon-red with a pinkish tinge, 1 to 1·5 mm. in diameter, and with a papillate surface owing to the protrusion of the apices of the ostioles; the stipe, which was pure white, measured about 20 mm. long and tended to turn and twist. The colour of the stroma, and the size of the perithecia and ascospores indicate that the species

comes nearest to, or is identical with, *C. microcephala* [ibid., xvi, p. 447; xvii, p. 269], regarded by Petch as a synonym of *C. purpurea*.

Wallin (J. R.) & Reddy (C. S.). **A bacterial disease of Phleum pratense L.**—*Phytopathology*, xxxv, 11, pp. 937–939, 1 fig., 1945.

A bacterial streak of timothy (*Phleum pratense*), first observed in Wisconsin in 1925, was present in Iowa in 1940 and widespread in the Ames district of the State in 1941. The lesions ranged from barely perceptible marks to streaks upwards of 2 cm. in length on the leaf blades of the young shoots, and when prevalent resulted in the stunting of the plants. In the hay stage the flag leaves developed a conspicuous streaking on the blades and sheaths. In severe cases the emerging heads were sealed in the spiral whorl by bacterial exudate or malformed on emergence from the boot. Under warm, humid conditions, droplets of yellowish bacterial exudate, turning into hard, resinous granules on drying, were produced on the surface of the lesions as late as November. In its cultural and biochemical characters and symptomatology the pathogen agreed for the most part with *Xanthomonas translucens* on barley, brome grass [*Bromus* spp.], rye, and wheat, but on the grounds of its failure to infect these hosts in cross-inoculation tests it is classified as a new variety, var. *phleipratensis*.

Corkill (L.) & Rose (R. E.). **Observations on susceptibility of Perennial Rye-Grass to blind-seed disease.**—*N.Z.J. Sci. Tech.*, A, xxvii, 1, pp. 14–18, 1 fig., 1945.

In 1940–1, 241 perennial rye grass (*Lolium perenne*) plants were inoculated by Rose's technique [see next abstract] with the agent of blind-seed disease (*Phialea temulenta*), which in seasons favourable to the fungus renders the New Zealand seed crop practically valueless. The material comprised 65 plants from four old-pasture Southland lines previously shown by Gorman's field tests to have a fairly high germinative capacity [*R.A.M.*, xx, p. 263]; 129 selected from 15 certified lines of very low germination; and 47 of certified origin that had produced high germinating seed crops under heavy natural inoculation in the field. The mean percentage infection in the two groups of certified plants was 28·3 and in the Southland lines 7, the difference of 21·3 with a standard error of 9·2 being significant at the 1 per cent. level. The mean percentage infection of the clone used as a standard was 49·2 (standard error 4·49). In the following season 11 resistant plants were used in seven reciprocal crosses, and five susceptible in five, and 154 offspring of the former and 74 of the latter inoculated with *P. temulenta*, giving rise to 31·7 and 73·5 per cent. mean infection, respectively, compared with 91·1 per cent. for the standard. The mean difference of 41·8 per cent. (standard error 3·5) between the resistant and susceptible groups is highly significant and points to the heritable nature of susceptibility to the disease.

Rose (R. E.). **A technique for the artificial inoculation of Perennial Rye-grass by the blind-seed organism.**—*N.Z. J. Sci. Tech.*, A, xxvii, 1, pp. 18–22, 1 graph, 1945.

Under the average climatic conditions prevailing in Palmerston North, New Zealand, during November and December, the high humidity and moderate temperature induced by the erection of a canopy of Hessian cloth over the propagation frames permits of heavy and uniform infection of susceptible perennial rye grass (*Lolium perenne*) plants by artificial inoculation with an aqueous suspension of the blind-seed fungus (*Phialea temulenta*) from Czapek-Dox cultures [see preceding abstract]. The plants are sprayed daily at 4.30 p.m. for about a week after the onset of flowering. To express the results of infection, 30 seeds are taken from each plant, each seed placed in a drop of water on a slide, the palea slightly

scratched with a needle, and microscopic examination made for the presence of conidia. Two classes of infection are differentiated, 'heavy' and 'light', and the percentage of 'effective infection' calculated on the basis of the former.

Benlloch (M.). **La viruela de las hojas de la Alfalfa Pseudopeziza medicaginis (Lib.) Sacc.** [Leaf spot of Lucerne, *Pseudopeziza medicaginis* (Lib.) Sacc.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiii, pp. 33–38, 4 figs., 1944.

Leaf spot of lucerne (*Pseudopeziza medicaginis*), already known from previous records to be widespread in Spain, was observed on a recent visit to Málaga to be causing heavy damage. The symptoms of the disease and the life-history of the causal organism are briefly described. The only practicable control measure is to expedite the cutting of the crop, which should take place before the leaves begin to fall or the apothecia responsible for the propagation of the fungus reach maturity.

Kräfta på frukträd. [Canker on fruit trees.] *Flygbl. Växtskyddsanst., Stockh.*, 76, 4 pp., 1 fig., 1945.

In this revised edition of pamphlet No. 41 in the same series, originally published in 1938, notes are given on the symptoms of fruit tree canker (*Nectria galligena*), the environmental conditions favouring its occurrence, its economic importance, varietal reactions to the disease, and control measures. In Sweden the fungus principally attacks apples [*R.A.M.*, xxi, p. 24], the most susceptible varieties of which are Alexander, Cox's Orange, Cox's Pomona, Gravenstein, White Transparent, and Åkerö, while Beauty of Boskoop, Bismarck, Boiken, Charlamowsky, Filippa, Golden Noble, and Sävstaholm are comparatively resistant. Pears and other softwoods serve as occasional hosts of the fungus. A severe winter, preceded by a mild, damp autumn, and a heavy summer rainfall are conducive to heavy infection by *N. galligena*, which also flourishes on stiff, wet soils and in closely planted orchards.

Dunegan (J. C.) & Isely (D.). **Leafhopper oviposition, the cause of one form of Apple measles.**—*Phytopathology*, xxxv, 11, pp. 870–876, 2 figs., 1945.

Evidence is presented in support of the view that the pustular type of apple measles, originally described by Hewitt and Truax (*Bull. Ark. agric. Exp. Sta.* 112, 1912), is caused by the deposition of leafhopper (*Typhlocyba pomaria*) eggs in the twigs. The disorder in question is considered to be quite distinct not only from the scurfy type of measles reported by these authors at the same time, but also from other obscure cortical abnormalities, such as Rose's rough bark or scurfy canker (*Phytopathology*, vii, pp. 198–208, 1917), Rhoads's isolated pustular, aggregate pustular, and canker forms [*R.A.M.*, iii, p. 722], Roberts's target canker [ibid., xiii, p. 384], Berg's black pox and internal necrosis [ibid., xiv, p. 372]; from the boron-deficiency manifestations investigated by Young and Winter [ibid., xvii, p. 400], Burrell (*Ext. Bull. Cornell agric. Exp. Sta.* 428, 1940), and Hildebrand (*Phytopathology*, xxix, p. 10, 1939); and from the adverse effect of high soluble-salt concentrations in the soil reported by Crawford from New Mexico [*R.A.M.*, xvii, p. 608].

Hammarlund (L.). **Sprøjtning af Æbletræer efter Fruktplukningen.** [Spraying of Apple trees after harvesting.]—Reprinted from *Gartnertidende, 1945*, 45, 1 p., 1945.

The apple scab fungus [*Venturia inaequalis*] overwinters in Denmark for the most part in the fallen leaves. Suppression of this source of reinfection is effected either by the burial or ploughing-under of the fallen leaves, a practice attended by considerable difficulty, or by spraying them with a fungicide, preferably towards the close of the dormant period. Of the various preparations tested against

the pathogen in laboratory experiments, ammonium sulphate and potassium sulphate appear likely to combine efficiency with economy (since they will serve simultaneously as fertilizers) in the orchard, but outdoor trials are necessary to confirm these observations.

Wilkinson (E. H.). **Observations on the perennial canker fungus, Gloeosporium perennans Zeller & Childs.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 77–85, 1 pl., 3 figs., 1945.

In this paper the author reviews his researches into the perennial canker disease of apples (*Glocosporium* [*Neofabraea*] *perennans*), already abstracted from other sources [*R.A.M.*, xxiv, p. 422]. In fruits the rate of decay is approximately the same as that produced by *G. album*, and much slower than in the case of *G. fructigenum*.

Christoff [Khristov] (A.). Приносъ къмъ проучването на червенитѣ петна по Сливата—**Polystigma rubrum (Persoon) de Candolle. I.** Гостоприемници и устоïчивость на сортоветѣ спрямо болестьта. [Plum red leaf spot disease —*Polystigma rubrum* (Persoon) de Candolle. I. Host relationships and varietal resistance.]—*Год. Земед.-Стоп. Изслед. и Опит. Инсти България.* [*Yearb. agric. Exp. Stas Bulgaria*], 1, pp. 63–69, 1943. [English summary. Received December, 1945.]

Red leaf spot disease [leaf scorch] of plum (*Polystigma rubrum*) [*R.A.M.*, xi, p. 660; xvi, p. 392] continues to occur with greater or less severity throughout Bulgaria, in some years causing partial or complete premature defoliation of the trees, progressively weakening them and inducing early death.

The author's researches from 1931 to 1943 showed, however, decided resistance on the part of *Crataegus*, almond, apricot, and wild cherry (*Prunus avium*), which exhibited no signs of attack even when planted among plum varieties severely affected by the disease. Up to 1943 the author had found *Polystigma rubrum* on *Prunus cerasifera*, plum, damson, *P. salicina*, and *P. spinosa*. There was great diversity in the susceptibility to the disease of varieties of these species and records compiled during the epiphytotic year 1941 showed that varieties of plum and damson varied in their susceptibility whilst those of *P. cerasifera* were either entirely or quasi-resistant. Yellow Afusca (*P. cerasifera*) was observed to be free from attack, Rivers Early, King, Montfort, Green Queen Claudia, and Schöne von Löwen plums were very slightly infected, Early Mirabelle damson and Bühler early plum slightly infected, and Küstendil, Ostava, Victoria, Anna Spät, and Italian plums were very susceptible, especially the two first-named.

Taylor (G. G.). **Experiments with spray treatments for control of diseases and pests of Raspberries.**—*N.Z.J. Sci. Tech.*, A, xxvii, 2, pp. 83–90, 1945.

In preliminary experiments in 1940-1 and 1941–2, and in a fuller series from 1942–3 to 1944-5 in Nelson Province, New Zealand, highly significant increases in raspberry yields and improvement in plant vigour were obtained by spraying with Bordeaux mixture and lead arsenate against two fungal diseases, cane spot (*Elsinoe veneta*) and leaf spot (*Septoria* [*Mycosphaerella*] *rubi*), and bud moth (*Carposina adreptella*). In 1943–4 the yield of sprayed Red Antwerps and Lloyd Georges amounted to 48·6 cwt. per acre compared with 38·9 for the untreated controls, the corresponding figures for 1944–5 being 43·9 and 29·5, respectively.

Suit (R. F.) & Palmiter (D. H.). **Control of Gooseberry diseases.**—*Bull. N.Y. St. agric. Exp. Sta.* 711, 22 pp., 7 figs., 1945.

A full account is given of experiments carried out in New York State from 1937 to 1944, inclusive, on the control of the three most important gooseberry diseases that occur locally, viz., powdery mildew (*Sphaerotheca mors-uvae*) [*R.A.M.*, xxiv,

pp. 193, 456], leaf spot (*Mycosphaerella grossulariae* and *Pseudopeziza ribis*) [ibid., xxiii, p. 327], and rust (*Puccinia grossulariae*) [*P. pringsheimiana*: ibid., xix, p. 200; xx, p. 72]. Of these, powdery mildew and leaf spot are general throughout the State, while rust is found in the Hudson Valley area. All the work was done on the large-fruited, English type of gooseberries, which are very susceptible to these diseases, and mostly on the Cautauqua variety. Powdery mildew seldom attacks the American types, though leaf spot and rust may produce defoliation.

The results showed that the best control of powdery mildew was given by one application immediately after bloom of lime-sulphur 2–100 plus ½ lb. spraysay A. The most important factor in the control of this disease was the timing of the spray, which must be applied as soon as the fruit has set; a delay of only one week will considerably increase the amount of mildew on the fruit. Copper fungicides were ineffective against powdery mildew during a dry season.

Against leaf spot the best control followed two applications of Bordeaux mixture (3–5–100) plus one pint S.E.C. oil, the first made about 1st June, when the disease was first noticed, and the second in July, immediately after picking. Lime-sulphur did not give control.

The simplest and most economical way to control rust, which is generally regarded as of small importance, because many holdings are unaffected, but which can present a major problem in plantings near the alternate sedge [*Carex*] host, was found to consist in eradicating the alternate host. The sedge plants were removed or burned in the late autumn or early spring. In cases where the sedge could not be removed three applications of lime-sulphur (2–100) at the green-tip stage, about 10 days later, and just before bloom gave perfect control.

Wilcox (R. B.). **Further tests of organic fungicides for control of Cranberry fruit rot.**—*Proc. Amer. Cranberry Grs' Ass.*, lxxv, pp. 16–22, 1945. [Abs. in *Exp. Sta. Rec.*, xciv, 1, p. 78, 1946.]

As in previous trials [in Massachusetts], fermate gave much better control of cranberry fruit rot [*Glomerella cingulata* var. *vaccinii* and other fungi: *R.A.M.*, xxiv, p. 458] than Bordeaux mixture, dithane A–10 was about equally effective while dithane B–11 satisfactorily combated field and early storage decays but was inferior to fermate against those occurring in the later stages of keeping, which were in general the most refractory. The 2–100 formula of fermate would appear to suffice for all ordinary purposes, but 3–100 may be used where severe infection or protracted storage is anticipated and 1–100 should be adequate for mild attacks.

Benlloch (M.). **Notas de patología olivarera en 1944.** [Notes on the pathology of the Olive in 1944.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiii, pp. 141–148, 6 figs., 1944.

The epidemic of olive knot (*Bacterium* [*Pseudomonas*] *savastanoi*) [*R.A.M.*, xxiv, p. 24] in Badajoz in 1944 was the worst within the writer's experience, having been aggravated by damage from cold and frost. Not only were the young branches attacked, but the main veins of the leaves and the petioles were also largely involved and the defoliation thereby increased.

A disease known as 'elongation', associated with decay of the trunk and main branches, is believed to be primarily of physiological origin, the only fungus (? *Acremoniella* sp.) encountered in the root system being too limited in scope to produce the serious aerial symptoms. The exposed roots of a certain number of trees in various localities were treated in February with copper oxychloride by Urquijo's method [ibid., xxi, p. 475] for chestnut ink disease [*Phytophthora cambivora*] control [cf. above, p. 153] followed by the application to the soil in the surrounding trench of ground copper sulphate at a dosage of 300 to 500 gm. per trunk. In the following September all the treated trees showed signs of improvement, but no definite opinion could be formed at this early stage as to the lasting efficacy of the method.

A new disease observed in the autumn in the province of Barcelona was characterized by foliar chlorosis, the leaves turning first yellow and then brown or snuff-coloured, and finally dying, and a varying number of necrotic areas in the cortex of the branches, which progressed from the tips downwards and contributed to dessication, especially of young trees. The roots did not appear to be affected. The examination of diseased material in the laboratory revealed no parasitic agency. A similar trouble in Italy has been attributed to a virus or boron deficiency and experiments are planned to ascertain whether these factors are implicated in Spain.

Il Centro di Studi sugli Anticrittogamici presso il R. Laboratorio Crittogamico e il R. Osservatorio Fitopatologico annessi all' Università di Pavia. [The Centre of Studies on Fungicides at the Royal Cryptogamic Laboratory and the Royal Phytopathological Observatory annexed to the University of Pavia.]—8 pp., 4 figs., Pavia, Premiata Tipografia Succ. Fusi, [1945].

In this leaflet an account is given of the methods used in testing fungicides at the Centre of Studies on Fungicides, attached to Pavia University, which was established in 1942, with R. Ciferri as Director and E. Baldacci as Assistant Director. The points dealt with cover *in vitro* and *in vivo* toxicity tests, tests of adhesiveness and 'residual fungicidal activity' (e.g., after rain), of emulsibility and wettability, of the ionic dissociation of active metals, of the dosage of metal the fungus can absorb, of scorching properties, and of the visibility of the deposit, and various subsidiary chemical studies.

Pollacci (G.) & Gallotti (M.). **Un nuovo anticrittogamico a base di mercurio.** [A new mercury fungicide.]—*Atti Ist. bot. Univ. Pavia*, Ser. iv[a], xiii, pp. 159–162, 1941. [Received February, 1946.]

Laboratory tests with a preparation containing sulphur proteinate of mercury [cf. *R.A.M.*, xviii, p. 781] are described. The substance inhibited the germination of *Alternaria tenuis* but gave conflicting results as a substitute for copper against *Plasmopara viticola*.

Pollacci (G.) & Gallotti (M.). **Un nuovo fitofarmaco a base di cloro.** [A new chlorine fungicide.]—*Atti Ist. bot. Univ. Pavia*, Ser. iv[a], xiii, pp. 171–173, 1941. [Received February, 1946.]

After stating that tests with various fungicides demonstrated that the spores of *Alternaria tenuis* are seven to eight times as resistant to these materials as are those of *Plasmopara* [*viticola*], the authors briefly describe the results of experiments made on *A. tenuis* with a new fungicide, 'ampelio C', which is stated to have given highly promising results in laboratory tests. It is made by dissolving 1 to 2 kg. solid calcium hypochlorite (20 to 25 per cent. active chlorine) and 15 gm. potassium bichromate in 100 l. water, and adding 1 to 2 kg. carbonate of lime. The quantities of the ingredients used vary with the parasite and the host. The amounts given above are intended for use against fungal diseases and insect pests of vine. The product is also prepared in dust form.

Christoff [Khristov] (A.). Възможности за предпазването на пръскачкитѣ и другитѣ метални съоръжения отъ разяждащото действие на разтворитѣ употрѣбявани при борбата съ болеститѣ въ градинарството. [The protection of orchard sprayers and other equipment from the corrosive action of solutions used in the control of horticultural diseases.]—*Год. Земед.-Стоп. Изслед. Опит. Инсти България* [*Yearb. Agric. Exp. Stas Bulgaria*], i, pp. 71–86, 1943. [English summary. Received December, 1945.]

The author gives a fully tabulated account of an investigation on the means of

protecting sprayers and other equipment from damage by solutions of mercuric chloride, sulphuric acid, or copper sulphate. Wooden vessels are preferable to metal ones and the possible use of concrete vessels is suggested for large scale application of solutions having non-acid reactions. Lard and witch elm tar proved satisfactory against sulphuric acid and lime-sulphate solutions, but were quite ineffective against mercuric chloride. Beeswax, paraffin wax (m.p. 55–57°C.), or asphalt and paraffin wax mixed in equal parts gave the best protection against all products. Pine resin, shellac, and coppalac resin varnishes gave good protection against lime-sulphur and were useful against corrosive sublimate. Ten per cent. celluloid solution in acetone and 20 per cent. asphalt solution in xylol gave excellent results, but their poor adhesiveness in some cases is a disadvantage. Concrete vessels dressed with asphalt or wax are suitable for all solutions.

Scott Watson (J. A.). **N.A.A.S.**—*J. Minist. Agric.*, lii, 10, pp. 469–471, 1946.

A brief account is given of the National Agricultural Advisory Service, to be established by the Ministry of Agriculture as from 1st October, 1946, in accordance with the recommendations of the Luxmoore Committee for the reorganization of advisory work. General advisers will be in close contact with individual farmers, while in each county or at the headquarters of the agricultural province specialists are to be stationed. These will maintain close touch with the Research Institutes and keep the general advisers supplied with new knowledge, assist them in difficult cases, and carry out field tests of new methods and machinery. The service is being organized and will be operated under the guidance of the Agricultural Improvement Council.

Whitehouse (H. L. K.) & Haldane (J. B. S.). **Symmetrical and asymmetrical reduction in Ascomycetes.**—*J. Genet.*, xlvii, 2, pp. 208–212, 1946.

In studies on *Neurospora sitophila* and *Bombardia lunata* asymmetrical post-reduction was found to be more frequent than symmetrical, i.e., when a pair of allelomorphs A and a segregate, the orders Aa Aa and aA aA are commoner than AaaA and aAAa. This does not obtain with *N. crassa*. Previous work had already shown that the frequency of pre-reduction (AAaa and aaAA) is variable.

Ramsbottom (J.). **Poisonous fungi.**—31 pp., 15 col. pl., 3 figs., Penguin Books, Ltd., 1945. 2*s*.

This is an attractively illustrated, popularly written account of 25 poisonous fungi, comprising chiefly Agaricales. It forms a companion volume to the author's similar account of edible fungi [*R.A.M.*, xxxiii, p. 493].

Gäumann (E.). **Pflanzliche Infektionslehre.** [Plant infection instruction.]—611 pp., 8 diags., 119 graphs, 1 map, Basel, Verlag Birkhäuser, 1945. Paper covers S. Fr. 44.50, bound S. Fr. 48.50.

This treatise is described in the author's foreword as an introduction to some of the biological problems underlying sickness and an amplification, on the theoretical side, of phytopathological instruction. It does not profess to cover the field of specialized plant pathology or to add to the knowledge of individual diseases, but seeks rather to represent general parasitological and epidemiological ideas by means of selected examples, and to paraphrase the associated technical terms (many originating in human medicine) in such a way as to adapt them to phytopathological use. The six chapters deal with (1) infection, (2) infection concatenations, (3) parasitic adaptation of the pathogen, (4) predisposition of the host to disease, (5) disease, and (6) control of infectious plant diseases [cf. *R.A.M.*, xxv, pp. 5, 76].

Titus (A. C.). **Fungus growths and electric apparatus.**—*Gen. elect. Rev.*, xlv, 8, pp. 19–22, 8 figs., 1945.

The damage caused on various kinds of electrical equipment by fungi [*R.A.M.*, xxiv, p. 379], particularly *Aspergillus niger* and *Chaetomium globosum*, is described and the difficulties of combating the trouble discussed. The moulds flourish under so-called 'tropical' conditions, which are, however, not necessarily confined to tropical countries but exist wherever relative humidities of 85 per cent. and upwards are combined with temperatures of 25° to 35° C., e.g., in an unventilated moisture-proof packing-case on a loading platform in Nebraska during a dry period. The high operating temperatures of certain apparatus necessitate a strong degree of resistance to heat in any fungicide intended for incorporation in the coating material (varnish or lacquer): the limits of efficacy of the three usual preparations, viz., phenyl mercuric salicylate, pentachlorophenol, and salicylanilide are 100°, 85°, and an intermediate point, respectively. The mercury vapour evolved through the decomposition of mercurials exerts an adverse effect on selenium rectifiers during non-operating periods, while fungicides of this nature are also liable to cause serious corrosion of aluminium. They and pentachlorophenol may further be a source of dermatitis or respiratory trouble among workers engaged in the manufacture of coatings.

O[ppermann] (R. H.). **Scientific fungus farm.**—*J. Franklin Inst.*, ccxxxix, 2, pp. 160–161, 1945.

A 'scientific fungus farm' has been established at the Schenectady [New York] Works Laboratory of the General Electric Company to facilitate research on the identity and control of the moulds responsible for damage to electrical war equipment [see preceding abstract].

Olson (J. C.) & Macy (H.). **Propionic acid, sodium propionate, and calcium propionate as inhibitors of mold growth. I. Observations on the use of propionate-treated parchment in inhibiting mold growth on the surface of butter.**—*J. Dairy Sci.*, xxviii, 9, pp. 701–710, 2 figs., 1945.

Parchment paper treated with 5 per cent. calcium propionate solution acidified to P_H 5·5 with lactic acid was equally effective in the inhibition of mould growth on unsalted butter at the Minnesota Agricultural Experiment Station with similar material treated in 10 per cent. of the unacidified solution, and more so in the improvement of the keeping quality of the product [*R.A.M.*, xxi, p. 80 *et passim*]. Both sodium and calcium propionate solutions were superior to a saturated solution of sodium chloride for the suppression of surface mould growth. Pre-storage of butter, wrapped in propionate-treated parchment, at 10° F. for up to three months did not interfere with subsequent protection against mould growth on transference to higher temperatures. Calcium propionate-impregnated parchment was effective only in the dry state. Heating the propionate solutions to 175° did not impair their efficacy.

Penicillium expansum was conspicuously more resistant to the inhibitory effect of calcium propionate than the other moulds used in the tests, viz., *Hormodendrum cladosporioides*, *Cladosporium* spp., *Stemphylium congestum*, and *Aspergillus niger*.

Westerdijk (Johanna). **Mycologie en industrie.** [Mycology and industry.]—*Fungus, Wageningen*, xv, 4, pp. 25–30, 4 figs., 1944. [Received January, 1946.]

Important developments in the field of technical mycology are surveyed and an interesting account given of its applications in industrial processes, including alcoholic fermentation, food yeast manufacture, cheese-ripening, and penicillin production.

Knight (S. G.) & Frazier (W. C.). **The effect of Corn steep liquor ash on penicillin production.**—*Science*, N.S., cii, 2659, pp. 617–618, 1945.

Supplements of maize steep ash significantly increased penicillin production by *Penicillium chrysogenum* strains NRRL 1951-B25 and X1612 in a synthetic medium [*R.A.M.*, xxv, pp. 129, 130]. Both strains produced more penicillin in the synthetic medium supplemented with 500 mg. ash than in the usual medium containing maize steep liquor. The P_H of the fermentations was always in the range for maximum penicillin production in shaken flasks. There appeared to be no difference between mould growth in the synthetic medium and that in the synthetic medium supplemented with ash. In further experiments the addition of supplements of maize steep liquor ash to the usual fermentation medium gave a 30 to 45 per cent. increase in penicillin production by both strains. The data obtained indicate that minerals play an important part in penicillin production. Further investigations on this point are in progress.

Florey (Sir H. W.), Jennings (M. A.), Gilliver (K.), & Sanders (A. G.). **Mycophenolic acid, an antibiotic from Penicillium brevi-compactum.**—*Lancet*, ccl, 6385, pp. 44–46, 1946.

Mycophenolic acid, one of the metabolic products of *Penicillium brevi-compactum*, was experimentally shown to be responsible for the antibacterial activity of the mould already reported by Wilkins and Harris [*R.A.M.*, xxiii, p. 56]. The writers further ascertained that it is fungistatic or fungicidal to a number of human pathogens, besides being completely or partially inhibitory to the growth of various plant pathogens. Thus, *Corynebacterium michiganense* was inhibited at a dilution of 1 in 320,000, *C. sepedonicum* at 1 in 160,000, *Xanthomonas begoniae* at 1 in 10,000, *Stereum purpureum* 1 in 80,000, *Verticillium dahliae*, *Claviceps purpurea*, *Phytophthora erythroseptica*, and *Rhizoctonia crocorum* [*Helicobasidium purpureum*] each at 1 in 20,000, and *R.* [*Corticium*] *solani* and *Actinomyces scabies* each at 1 in 5,000.

Nandi (P.). **Antibacterial substances from moulds.** —*Sci. Cult.*, xi, 6, pp. 290–293, 2 graphs, 1945.

The optimum conditions necessary for the production of an antibacterial substance by a strain of *Penicillium citrinum* [*R.A.M.*, xxi, p. 344] isolated from garden soil at the Bose Research Institute, Calcutta, on Czapek-Dox medium modified in various ways are fully discussed, and the technique for routine experiments of its potency against *Staphylococcus aureus* described.

Birkinshaw (J. H.), Bracken (A.), & Raistrick (H.). **Studies in the biochemistry of microorganisms. 73. Metabolic products of Aspergillus fumigatus Fresenius.** —*Bio-chem. J.*, xxxix, 1, pp. 70–72, 1945.

The metabolic products of a strain of *Aspergillus fumigatus*, isolated from Beaconsfield (Bucks) soil and grown on Czapek-Dox glucose solution, were investigated. The antibiotic, helvolic acid, was isolated, together with substantial amounts of ethylene oxide-$\alpha\beta$-dicarboxylic acid and small quantities of oxalic acid.

Thaysen (A. C.) & Butlin (K. R.). **Inhibition of the development of Fusarium oxysporum cubense by a growth substance produced by Meredith's Actinomycetes.**—*Nature, Lond.*, clvi, 3974, pp. 781–782, 1945.

Acting on a suggestion by Dr. Portheim that gliotoxin-producing fungi may be found useful against plant diseases caused by bacteria and fungi [cf. *R.A.M.*, xxiv,

p. 427: xxv, p. 75], the authors undertook to determine the gliotoxin production of a culture of *Trichoderma viridans* [*T. viride:* ibid., xxiv, p. 68] when grown on beer wash water. As a test organism a standard strain of *Bacterium* [*Bacillus*] *subtilis* was used, which had been proved to be inhibited in its growth by gliotoxin at 6 p.p. million. It was found that though *T. viride* grew abundantly on the beer wash water at a temperature between 25° and 30° C., it had no inhibiting action on the bacterium. It was, therefore, concluded that, under the experimental conditions, *T. viride* had not produced gliotoxin.

Cultures of Meredith's Actinomycetes antagonistic to *Fusarium oxysporum* [var.] *cubense* [ibid., xxiii, p. 447] were also grown on beer wash and on waste liquors from food yeast. After incubation at 30° for one month, the inoculated liquor from food yeast was found to be covered by a pink pellicle of Actinomycetes. When 4 ml. of this medium, freed from living cells by centrifuging, were added to 10 ml. wort agar, the mixture allowed no growth of *F. oxysporum* var. *cubense*, even when the plate was heavily inoculated with a fresh culture of the fungus. Control plates made up of wort agar with 4 ml. of the original medium showed abundant growth of *F. oxysporum* var. *cubense* in two days. After five weeks' growth in food yeast waste liquor, the concentration of the inhibiting substance produced by Meredith's organisms had increased to such an extent that one ml. of the liquor prevented the growth of *F. oxysporum* var. *cubense*.

The active substance responsible for this toxicity was shown to be thermolabile and unable to pass through a porcelain filter. Further work is in progress.

Brien (R. M.) & Dingley (Joan M.). **Rot-proofing of canvas. Preliminary report on experiments carried out in 1944–45.**—*N.Z.J. Sci. Tech.*, B, xxvii, 2, pp. 133–138, 1 fig., 1945.

At the request of the New Zealand Standards Institute a series of investigations was carried out to establish a suitable technique for testing preservatives for canvas, cordage, and the like [*R.A.M.*, xxv, pp. 74, 131]. Of the numerous common moulds isolated from rotted canvas specimens, only *Memnoniella echinata* and *Stachybotrys atra* [ibid., xxv, p. 40] caused appreciable decay of the fabric, and of these the latter was selected as preferable for further trials on account of its prolific production of dark-coloured spores. A method was evolved whereby strips of 12–02. cotton duck, treated with seven chemicals at varying concentrations, were inoculated with *S. atra* and held for three to four weeks under optimum temperature (27° C.) and moisture conditions (tied to sterile 4-in. sections of porous earthenware field pipes 2-in. in diameter and placed in covered glass jars containing 60 ml. sterile water). In this series of tests sodium salicylanilide (shirlan W.S.) conferred protection against rotting at and upwards of 0·5 per cent., while sodium pentachlorphenate (santobrite) was effective from 0·05 to 2 per cent.; at the latter dosage, however, there was a significant loss in tensile strength. Pentachlorphenol and copper oleate in mineral turpentine exerted a preservative action at 0·5 and the copper and zinc naphthenates in mineral turpentine at 0·05 per cent.

In another series of experiments, in which the treated canvas strips were subjected to leaching by a rotating spray of water for ten three-hour periods and dried after each for 1½ in an oven at 45° to 50° before inoculation, there was a greatly increased loss in tensile strength in those treated with salicylanilide and sodium pentachlorphenate even at the maximum strength, while in the case of pentachlorphenol a 3 per cent. concentration would evidently be necessary to prevent disorganization by *S. atra*. Phenyl mercuric acetate permitted significant loss in the tensile strength of leached strips at 0·01 and 0·05 per cent. Leaching did not materially impair the efficiency of copper naphthenate even at the minimum concentration, but in the specimens treated with zinc naphthenate and copper

oleate the reductions in tensile strength were heavy at 0·1 and significant at 0·5 per cent.

Greathouse (G. A.) & Ames (L. M.). **Fabric deterioration by thirteen described and three new species of Chaetomium.**—*Text. Res. J.*, xv, 6, pp. 223–225, 1 fig., 1945.

This is an abridged version, embodying the information likely to interest workers on current fabric and cordage problems, of the authors' recent paper on the relation of *Chaetomium* spp. to cellulose decomposition [*R.A.M.*, xxiv, p. 330].

Dempsey (Mary). **The mould-proofing of leather.** *J. int. Soc. Leath. Chem.*, xxix, 6, pp. 133–142, 2 figs., 1945.

This is a fuller account of the author's paper on mould damage to leather and its control by treatment with para-nitrophenol or beta-naphthol than that already noticed from another source [*R.A.M.*, xxiv, p. 461]. In order to satisfy the requirements of the British Leather Manufacturers' Research Association, treated material should remain practically mould-free for four weeks at a temperature of 30° C. and 100 per cent. relative humidity.

Arens (K.). **Um fungo destruidor de pinturas a oleo : Cladosporium herbarum (Pers.) var. nigricans (Roth).** [A fungus destructive to oil paintings: *Cladosporium herbarum* (Pers.) var. *nigricans* (Roth).]—*Sum. brasil. Biol.*, i, 1, 13 pp., 8 figs., 1945. [English summary.]

In Brazil, as in Europe, oil paintings are subject to disfigurement by black spots, the agent of which in the author's investigations in Rio de Janeiro was identified as *Cladosporium herbarum* var. *nigricans* [*R.A.M.*, xvii, p. 195 *et passim*]. On a medium of wood extract plus 1 per cent. linseed oil with a 2 per cent. agar base deep black colonies were formed in the course of a fortnight. Microscopic examination of the affected pictures showed that the mycelium of the fungus perforates the superficial pellicle formed by a colloid-chemical process and penetrates the underlying layers, where conidia are produced which rupture the pellicle in their emergence. The infiltration of moisture through the broken protective tegument and the corrosion induced by the metabolism of the hyphae aggravate the trouble, which is not only destructive to the canvases but mars their decorative effects. The pathogen can be effectively combated only by the provision of a dry atmosphere, a difficult matter in the humid climate of the Brazilian coast, but its development may be arrested by the application to the canvas of a fungicide, e.g., zinc silicofluoride, zinc borate, or zinc benzoate, as recommended by Findlay [ibid., xix, p. 719], or 5 per cent. copper oxide, advocated by Mattiello in 'Protective and decorative coatings', New York, 1944.

Elisei (F. G.). **Sulla germinazione di alcune ife ficomicetoidi extraradicali.** [On the germination of some extra-radical Phycomycetoid hyphae.]—*Atti Ist. bot. Univ. Pavia*, Ser. iv[a], xiii, pp. 131–158, 30 figs., 1941. [Latin summary. Received February, 1946.]

A full account is given of experiments in which the author succeeded in germinating in hanging-drop cultures portions of extra-radical hyphae of the Phycomycetoid fungus [*Rhizophagus*: *R.A.M.*, xviii, p. 470] on *Polianthes tuberosa* var. *flore pleno*. Conidial formation took place, and the new mycelium that arose was ascertained to be that of a *Fusarium*, but the author considers it is probable that the endomycetoid fungus is a Phycomycete, though the possibility of a *Fusarium* or some other fungus being involved has not yet been disproved.

Elisei (F. G.). **Isolamento e coltura artificiale di un Ficomicete con ife gomiti e a sporgenze laterali coniche.** [Isolation and artificial culture of a Phycomycete with hyphae presenting geniculations and conical lateral swellings.]—*Atti Ist. bot. Univ. Pavia*, Ser. iv[a], xiii, pp. 163–166, 3 figs., 1941. [Received February, 1946.]

In this preliminary note, the author states that during his studies on the Phycomycetoid mycorrhizal fungus [*Rhizophagus*: see preceding abstract], he obtained germination of extra-radical hyphae from affected roots; this proved to be a Phycomycete with geniculate hyphae bearing conical lateral swellings.

Fries (N.). **Beobachtungen über die thamniscophage Mycorrhiza einiger Halophyten.** [Observations on the thamniscophagous mycorrhiza of some halophytes.]—*Bot. Notiser, 1944*, 2, pp. 255–264, 3 figs., 1944.

Of 14 halophytes examined on the island of Nordkoster, off the west coast of Sweden, in the summer of 1939, thamniscophagous mycorrhiza were found in association with *Aster tripolium*, *Matricaria maritima*, *Plantago maritima*, *Glaux maritima*, *Ranunculus cymbalaria*, and *Armeria maritima*. In the case of the three first-named hosts, typical arbuscules [*R.A.M.*, xxiii, p. 402] were formed in all the layers except those of the exo- and endodermis, in *G. maritima* mostly in the outer, and in *R. cymbalaria* almost exclusively in the innermost stratum. The available material of *A. maritima* was too scanty to permit of a detailed description. The vesicles in *Aster tripolium*, *M. maritima*, and *P. maritima* measured 40 to 100 by 30 to 60 μ and occurred both in the inter- and intracellular regions; these bodies were not detected in *G. maritima*. The diameter of the nuclei in the cells of *R. cymbalaria* containing arbuscules was about 30 per cent. larger than those of the univaded ones ($8{\cdot}8 \pm 0{\cdot}2$ as compared with $6{\cdot}5 \pm 0{\cdot}25$ μ). A similar phenomenon was noted in *Juniperus communis*, in *Vinca* [*minor*] by Demeter in Germany [ibid., iii, p. 413], and in *Eriostemon crowei* by McLuckie and Burges [ibid., xii, p. 311].

Brown (R.). **Biological stimulation in germination.**—*Nature, Lond.*, clvii, 3977, pp. 65–69, 1946.

A comprehensive, documented survey is given of the literature on the stimulation of fungus spores, seeds, and pollen grains by biological agencies. The author concludes that there is abundant evidence to show that germination of these organs will not occur when external supplies of particular activators are not available. These activators are produced in actively metabolizing tissues of a large number of species. It is suggested that dependence upon a particular activator is due to failure to synthesize this or a similar substance.

Madsen (S. B.). **Om Bekæmpelse af Kartoflens Virussygdome særlig ved Forædling og Fremavl.** [On the control of Potato virus diseases, especially by breeding and propagation.]—*Medd. VetHøjsk. Landbr. Plantedyrk. Afd., Kbh.*, 23, 85 pp., 1944. [English summary.]

The influence of environmental conditions on the reaction of potatoes to virus diseases has been clearly brought out by a series of experiments, in progress since 1915, on the yield of seed from different parts of Denmark [*R.A.M.*, xvii, p. 338]. North Jutland has been shown to be the best area for propagation, while potatoes grown on the islands are particularly subject to virus infections.

Protracted periods of drought, bringing growth to a standstill, enhance the tendency to degeneration, while excessive humidity may also act adversely on the host, which is favoured, on the other hand, by warm weather and a regular water supply. The nature of the soil *per se* exerts no influence on the virus development, but the various amendments added may be of considerable importance in this

respect. Klapp reports from Germany [ibid., xvi, p. 52] that potassium nitrate and potassium chloride are conducive to good stands, while ammonium sulphate and potassium sulphate produce the opposite effect. Danish experiments have shown that the two latter compounds may advantageously be applied before the two former. The exclusive use of potassium chloride is injurious where phosphoric acid is deficient. Liberal supplies of stable manure are particularly beneficial. The question of the right time for planting is somewhat complicated. When the operation is postponed, and the growth period consequently shortened, the symptoms are milder and the plants tend to outgrow them. Late-planted stands, moreover, escape the period of maximum aphid activity and therefore contract fewer fresh infections than those of earlier dates. At the same time, it must be borne in mind that early-planted tubers produce heavier yields than late-planted, while the longer growing-period gives more opportunity for starch accumulation. Therefore, despite the risk of some increase in virus diseases in early crops, late planting cannot be recommended to commercial growers. Pre-germination (sprouting) gives the tubers a good start and helps them to outdistance the viruses.

Four possibilities of combating potato virus diseases exist, namely, cure, immunization, breeding of resistant varieties, and propagation of healthy plants. Cases of actual cure, involving the disappearance of the virus and not merely of the associated symptoms, are exceptional, but there seems to be some prospect of immunizing plants against severe strains of potato virus X by inoculation with milder forms of the same virus. From the practical standpoint, however, only breeding and propagation deserve fuller consideration. In a four-year experiment at Lyngby (near Copenhagen), where virus diseases are prevalent, the state of health and yield of 36 varieties of (*a*) north Jutland and (*b*) local provenance were compared. Only two varieties of origin (*a*) developed leaf roll during the trial period namely, Fürstenkrone and Pepo, and that only to the extent of 1 per cent., while 14 were affected by virus X, viz., Bravo (2 per cent.) Deodara (10), Fürstenkrone (1), Hammersmith (100), Imperia (19), Juli (2), Kerr's Pink (5), King Edward (5), Majestic (2), Pepo (3), Preussen (19), Rheinland (87), Sharpe's Express (2), and Up-to-Date (1). As regards (*b*), the only varieties free from leaf roll were Ackersegen, Bravo, Hammersmith, and Imperia [no figures in respect of either disease are given for Di Vernon], the percentage of infection among the remainder ranging from 7 in King George and Rheinland to 100 in Golden Wonder and Aeggeblomme, closely followed by Preussen (99), Birgitta (98), Magnum Bonum (94), Juli (91), and Askebladet (90). Virus X was less in evidence, except in Hammersmith and Rheinland (both 100 per cent.); 17 varieties were free from infection, and the percentage in the rest ranged from 1 in King George to 52 in Bravo. The maximum yield reductions at the close of the test, compared with the output of healthy stock from north Jutland, amounted to 83 and 82 per cent. in Magnum Bonum and Golden Wonder, respectively, the figures for the other varieties ranging from (—2) in Imperia to 63 in Gelkaragis; Pepo and King George gave a reasonably good performance with 5 and 6 per cent. respectively. Ackersegen was free from leaf roll and virus X throughout the experimental period and sustained only 13 per cent. yield reduction; Beveländer from Jutland was not infected by either virus but the Lyngby stock developed 9 per cent. leaf roll and 6 per cent. virus X, and the reduction amounted to 25 per cent.; Majestic of provenance (*a*) contracted 2 per cent. virus X and that of (*b*) 29 per cent. leaf roll, and the yield was reduced by 27 per cent., while the (*a*) stock of Sharpe's Victor remained healthy, (*b*) showed 25 per cent. leaf roll, and the fall in output reached 15 per cent. Some degree of tolerance appears to reside in the Parnassia, Webb's Early, Kerr's Pink, Silesia, Bravo, and Burbank varieties, the yield reductions in which were not excessively heavy (maximum of 25 per cent. in Parnassia) despite their susceptibility to leaf roll.

The diagnosis of virus infections may be made by Köhler's method of testing the sprouted 'eyes' (a modification of tuber-indexing) [ibid., xv, p. 43] or by the use of differential varieties which react in a particular manner to inoculation by the several viruses, while serological procedures may give valuable assistance in special cases.

Control by propagation, which is still the most effective weapon in the campaign against potato viruses, falls into two parts, one negative and the other positive. The former, which is preferable for the commercial grower, involves the roguing of diseased individuals from a stand and the propagation of the remaining healthy plants [ibid., xi, p. 667]; the latter, more suitable for breeders of seed-potatoes, necessitates the selection of sound plants for propagation. Several organizations exist in Denmark for the propagation of healthy potato stocks. The Danish Alcohol Factories, Ltd., and all flour mills produce seed for the use of their growers, and the former has also established a moorland seed-potato farm in north Jutland, whence stocks are supplied to less favoured districts, notably the Copenhagen region. The methods of selection described in connexion with breeding are also applicable to propagation, for which, however, Oortwijn Botjes's 'clone cultivation' (*Rep. int. Conf. Phytopath. econ. Ent.*, pp. 142–147, 1923) has proved particularly well adapted. The same authority has emphasized the importance of lifting the tubers early (before maturity) as a means of protection against virus infection [*R.A.M.*, ii, p. 519; iii, p. 101]. In 1942, a committee representing various co-operative societies and other interested parties was set up with a view to securing uniformity of grading seed stocks, the following procedure being adopted. Planting material for propagation is provided by the progeny of clone cultivation passed as élite or class A. Two field inspections are made, the first at the onset of flowering and the second a fortnight later, at which the following are the maximum disease counts allowed (per mille): élite, first inspection, extraneous varieties (other than the particular one authorized for cultivation on a given farm) 0, black leg [*Erwinia phytophthora*], leaf roll, and severe mosaic [? virus Y] 2 each; second inspection, 0 for all categories; class A, first inspection, extraneous varieties 1, black leg 2, leaf roll and severe mosaic 10 each; second inspection, 0, 2, 2, and 4, respectively; class B, first inspection, extraneous varieties 2, black leg 10, leaf roll and severe mosaic 20 each; second inspection, 0·1, 5, 5, and 5, respectively. The total numbers of extraneous and diseased plants in class A at the first and second inspections must not exceed 20 and 5, respectively, and in class B, 40 and 12, respectively.

Larson (R. H.). **Resistance in Potato varieties to yellow dwarf.**—*J. agric. Res.*, lxxi, 10, pp. 441–451, 2 figs., 1945.

Tests with the potato varieties Russet Burbank, Red Warba, and Sebago, showed all three to offer a high degree of field resistance to the yellow dwarf virus, widely transmitted in central Wisconsin by the clover leafhopper (*Aceratagallia sanguinolenta*) [*R.A.M.*, xxiii, p. 490], although there is no direct correlation between the time when a variety reaches maturity and resistance to the disease. For example, the two most resistant varieties were Warba, which matures early, and Sebago, which matures late. The low incidence of the disease in certain varieties exposed to severe virus infection is not the result of the avoidance of any variety by the vector, as was thought in preliminary studies [ibid., xix, p. 39], for the insect was as numerous on resistant as on susceptible varieties, but is considered to be due to the exclusion of the virus in certain individuals in a clone, resistance being effective at the threshold of infection rather than after the virus has become established. A high degree of resistance is usually associated with a low percentage of non-emerging hills, such as constituted an interesting feature of the present tests; and more important was the fact that virus-infected tubers of the three varieties failed to show the characteristic tuber malformation or internal rust-brown

flecking common to yellow dwarf infection, a practical consideration in relation to table-market quality, particularly in the late-maturing varieties. The planting of such resistant varieties in central Wisconsin is recommended not only in order to secure increased yield, but because it should greatly reduce the cost of production with the elimination of the yearly purchase of seed stocks for yellow dwarf areas.

LeClerg (E. L.). **Genetic leaf roll of Irish Potato seedlings.**—*Phytopathology*, xxxv, 11, pp. 877–878, 1 fig., 1945.

A leaf roll of potato seedlings grown from true seed in the greenhouse was observed at the Louisiana Agricultural Experiment Station in the winter of 1943, both crosses, e.g., 528–170 × (XL–72–1), 528–170 × (XL–72–1), and reciprocals, and inbred progenies (XL–72–1 selfed) being involved. The leaf margins rolled upwards, starting at the base of the plant and proceeding towards the apex, and frequently showed a reddish-purple tinge. Stem-graft inoculations with the affected plants on healthy stocks gave negative results, and tubers from rolled individuals, planted in Tennessee in the spring of 1944, yielded normal plants. This type of leaf roll is limited to small seedlings from true seed in clay pots and does not appear in plants grown from tubers produced by these plants. The disorder, therefore, is evidently of a hereditary character, but quite distinct from the non-virus leaf roll previously described as occurring in field-grown plants [*R.A.M.*, xxiii, p. 275].

Kreutzer (W. A.), Henderson (W. J.), & Lane (G. H.). **The comparative effectiveness of certain cutting-knife treatments in the control of ring rot of Potatoes.** —*Amer. Potato J.* xxii, 5, pp. 127–133, 1945.

In experiments carried out near Monte Vista, Colorado, at an elevation of 7,600 ft., 35 sacks of clean but unwashed Red McClure seed-potatoes were cut at five-sack intervals after contamination of the rotary cutting knife with *Corynebacterium sepedonicum*, the knife being dipped in a 5-gal. tank of 0·2 per cent. mercuric chloride. Complete protection resulted after cutting 5, 10, 15, and 20 sacks, but infection appeared after cutting 25. Field plantings of all the sacks produced only one infected plant. When 15 sacks were cut, using a 1-gal. tank of 0·2 per cent. mercuric chloride, 5 sacks were cut safely, but 4 per cent. infection developed in test lots after cutting 10, and no protection resulted after cutting 15. The use of boiling water (199° F.) to sterilize the knife afforded complete protection, but santophen 2 and 7 (commercial mixtures of ortho- and para-benzylphenol) at 0·5, 0·1, and 0·05 per cent. did not prevent infection.

Starr (G. H.) & Riedl (W. A.). **Potato ring-rot and its control.**—*Bull. Wyo. agric. Exp. Sta.* 270, 16 pp., 10 figs., 1945.

After stating that, according to recent surveys, potato bacterial ring rot (*Corynebacterium sepedonicum*) [*R.A.M.*, xxiv, pp. 31, 337] is again increasing in many parts of the United States, the authors describe the symptoms of the disease and give detailed recommendations for its control. These include the use of disease-free seed, produced by methods involving hill- and tuber-indexing and unit planting, and field roguing; seed, knife, and sack disinfection, cellar sanitation, and disinfection of equipment; and the use of resistant varieties, of which Wyoming 27 (U.S.D.A. 47102), one of 13 seedlings remaining free from infection in five years' tests, is being increased with a view to its possible introduction into commerce.

Slosser (J. W.). **An improved sprayer boom for Potatoes and other row crops.**—*Agric. Engng, St. Joseph, Mich.*, xxvi, 11, pp. 453–455, 7 figs., 1945.

A full description is given of an improved sprayer boom, devised and constructed at the Maine Agricultural Experiment Station, for the application, primarily to potatoes, of Bordeaux mixture and calcium arsenate for the joint control of late

blight [*Phytophthora infestans*] and chewing insects. Among the advantages of the new apparatus are greater total coverage of the plants (including the under sides of the leaves, where both fungal and insect attacks tend to originate), increased uniformity and distribution of spray material, and lower operating pressure (100 to 125 compared with the normal 350 to 400 lb.), with consequent reduced costs due to longer life and more economical fittings.

Trials of Potatoes for immunity from wart disease.—*J. Minist. Agric.*, lii, 10, pp. 475–476, 1946.

A further descriptive list is given of new potato varieties found in trials by the Ministry of Agriculture to be immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, xxiv, p. 33]. They are (early) Ulster Premier, (second early) Ulster Ensign, (early maincrop) Arran Viking, St. Aidan, Ulster Commerce, and Venus, and (maincrop) Stormont Star.

Moore (F. Joan). **A comparison of Fusarium avenaceum and Fusarium caeruleum as causes of wastage in stored Potato tubers.**—*Ann. appl. Biol.*, xxxii, 4, pp. 304–309, 1 graph, 1945.

Wastage of stored potato tubers, partly through the agency of *Fusarium caeruleum* [*R.A.M.*, vii, p. 466; xix, p. 614, and next abstract], and partly through that of *F. avenaceum* [ibid., vii, p. 466], not hitherto reported as a pathogen of potatoes in Great Britain, led the author to undertake a series of experiments with a view to comparing the activities of these two parasites. Of the four varieties tested in clamps for susceptibility, Majestic, King Edward, Doon Star, and Arran, King Edward proved the most susceptible to *F. avenaceum* and Doon Star to *F. caeruleum*. Optimum temperatures for growth on potato-dextrose agar were 20° to 25° C. for *F. avenaceum* and 20° for *F. caeruleum*; maximum temperatures were > 30° and 30°, respectively. For infection of wounded potato tubers, cardinal temperatures for *F. avenaceum* were similar to those for growth on agar, but for *F. caeruleum* the optimum was 15° and the maximum 25°. The optimum temperature for rotting tended, with both species, to be higher in the more susceptible potato varieties. At low temperature *F. caeruleum* caused quicker rotting than *F. avenaceum*, although its rate of growth on agar was little more than half that of the latter. High humidity was particularly favourable to rotting by *F. avenaceum*, while *F. caeruleum* was more tolerant of low humidity. Both species caused quicker rotting in the clamp than in store, although there was no appreciable difference in mean temperature of one and the other, a factor attributed to the higher atmospheric humidity in the clamp.

Padwick (G. W.) & Ganguly (D.). **Stackburn disease of Rice in Bengal.**—*Curr. Sci.*, xiv, 12, pp. 31–32, 2 figs., 1945.

Out of 40 rice seeds of normal or discoloured appearance sown in Roux tubes on cotton soaked in distilled water 21 failed to germinate, and of these six were found to be contaminated by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*], four by *Curvularia lunata*, seven by a white mould tentatively identified as *Trichoconis caudata* [*R.A.M.*, xvi, p. 490], and four by common moulds. Ten of the germinating seedlings bore minute, black sclerotia, 52 to 195 (mean 124) μ in diameter, on the coleoptile, first leaf, and roots, and on transference to a moist chamber four of the infected plants produced the typical white mycelium and caudate conidia, 103·2 to 172·7 by 3·5 to 15·7 (146·2 by 12·6) μ, including the appendage, of *T. caudata*. In inoculation experiments on 500 seeds each of six varieties, *O. miyabeanus* caused the heaviest infection (62 diseased) on Kumargorh and the least (12) on Nigersail, the incidence of *C. lunata* was highest (45) on Latisail and lowest (5) on Patnai 23, and the white mould was most pathogenic (45) to Nigersail and least so (12) to Patnai 23 and Du Lar. The damage caused by *T. caudata* in Bengal has not been assessed.

The treatment of brown bast.—*Adv. Circ. Rubb. Res. Scheme Ceylon* 24, 4 pp., 1945.

Suggestions are made for the treatment of brown bast of *Hevea* rubber [*R.A.M.*, xxv, p. 43] in stands of improved planting material (bud grafts and clonal seedlings) recently come into tapping. The recommendations laid down include making frequent counts of the number of trees with 2 in. or more of the cut dry, particularly in the third and subsequent tapping years, and adopting a milder system of tapping if the number of diseased trees so counted reaches $7\frac{1}{2}$ per cent. of the stand; resting affected trees for a month, and adopting a milder tapping system if the dry area persists or, alternatively, isolating short, dry patches up to 4 in. long and continuing tapping; and, finally, making a trial of the scraping or tapping off treatment, or both, on trees on which the affected area is spreading.

Oidium leaf disease.—*Adv. Circ. Rubb. Res. Scheme Ceylon* 22 (Suppl. 2), 1 p., 1945.

During 1943, there was a shortage of sulphur on many rubber estates in Ceylon, and the following year systematic dusting again could not be carried out, as heavy rains fell during refoliation. Trees old enough to 'winter' were severely affected by *Oidium* [*heveae*: *R.A.M.*, xxiv, pp. 203, 204], and many were attacked later on by *Diplodia* [loc. cit.], causing die-back varying in severity from the loss of a few small branches to the death of the main stem almost to ground-level. It was considered that *Diplodia* had gained entrance owing to the weakened condition of the trees.

Observations on one estate indicated that the extent of the damage caused by *O. heveae* and die-back varied with different clones. Clone BD. 5 was the most severely affected, followed by TJ. 16 and TJ. 1, while GL. 1 suffered least. Individual trees of GL. 1 were, however, almost entirely defoliated, indicating that this clone possesses no natural resistance to *O. heveae* other than that associated with time of wintering.

Further commercial replanting in mid-country areas is not advised, unless it is found that adequate protection can be afforded to young rubber districts by sulphur-dusting, or resistant planting material becomes available. It is pointed out that regulations issued in 1938 provided that permits for new planting should not be issued for land at or over an elevation of about 1,000 ft. above mean sea-level.

Klechetov (A. N.). **A new bacterium on the rubber plant Tau-saghyz.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xlvii, 5, pp. 377–378, 1945.

In the course of field and pot-culture experiments on the nitrogen relationships of the rubber plant, tau-saghyz [*Scorzonera tau-saghyz*], an examination of microtome sections of the mycorrhiza led to the detection in preparations of sound plants, alongside the fungus, of a bacterium which was also present in the roots (particularly at the tips of young roots), peduncles, leaves, flower heads, and seeds. The bacterial cells are spherical, 0·4 to 0·8 μ, single, in pairs, or in short chains; the colonies are drop-like, greyish-white, with an even margin, smooth surface, and semi-transparent. It is thought possible that the organism is able to fix atmospheric nitrogen.

Cross (W. E.). **El efecto del 'carbón' en las Cañas de distintas variedades durante el año agrícola 1944-1945.** [The effect of 'smut' on Canes of different varieties during the agricultural year 1944–1945.]—*Bol. Estac. exp. agríc. Tucumán* 55, 31 pp., 1945.

From this further tabulated survey of the performance of different sugar-cane varieties in respect of smut [*Ustilago scitaminea*] in Tucumán, Argentina [*R.A.M.*, xxiii, p. 189; xxiv, p. 338], it appears that, of the 270 graded as practically immune in 1944, 241 are retained in the same category on the basis of the latest trials, 28 fall

into the group of slightly infected (resistant), and one has been eliminated; of the 67 resistant in 1944, 43 remain in the same class, 14 are raised to the rank of practically immune, and 10 were reduced to the susceptible grade; and of the 66 susceptible in 1944, the reactions of 60 were unchanged, five were re-graded in the resistant class, and one was excluded from future tests.

Quintanilha (A.) & Balle (S.). **Étude génétique des phénomènes de nanisme chez les Hyménomycètes.** [A study of the phenomena of dwarf development in the Hymenomycetes.]—*Bol. Soc. broteriana*, Sér. 2, xiv, pp. 17–48, 1 pl., 10 figs., 1940. [Received January, 1946.]

Wide variations have been observed in the virility of mycelia, obtained under favourable conditions *in vitro*, of cultures of *Coprinus fimetarius*. Cultured simultaneously and under identical conditions, some spores produce vigorous mycelia, with abundant ramification, while others produce only a thread, often very short, with little or no ramification, which it is extremely difficult to transfer. These two forms of mycelia have, therefore, been classified as normal mycelium, and dwarf mycelium, respectively, each of which, particularly the second, is capable of presenting considerable fluctuations in development.

The authors' researches show two cases of stunted development to be in evidence as a result of their studies, one phenotypic and non-hereditary, and the other genotypic in character. One pair of genes (N, n) is responsible for these two forms of normal and dwarf growth. (N) is dominant, the result being that the secondary heterozygous (Nn) mycelia and the fructifications which they engender resemble the homozygous (N, N) mycelia and fructifications. The secondary recessive homozygous (n, n) mycelia are not viable. The two factors (N, n) are transmitted independently of the sterility (A, a, B, b) factors. Certain strains present only phenotypic dwarf development, others only genotypic dwarfing. Irregularities in other strains suggest a superposition of the two phenomena, accompanied possibly by a reduced likelihood of the factors of dwarfing becoming manifest and in the degree that they may so become. The variations in temperature adopted during these experiments (18° to 32° C.) were shown to be without effect on the phenotypic character of the two categories of mycelia. Wide variations of osmotic pressure in culture (0·06 to 12 atm.) were readily supported both by dwarf and normal progeny, without any differential influence on the type and rhythm of growth of either category (N and n). Above 12 atm. dwarfs remain dwarfs, but the normal progeny acquire with the increase in osmotic pressure the morphological characteristics and growth rhythm of the dwarfs. Sugars of different molecular weights act in virtue of the osmotic pressure of their solutions and not in that of their concentrations.

Andersson (O.). **Studier över Boletacéer.** [Studies on Boletaceae.]—*Bot. Notiser*, *1943*, pp. 185–202, 1 fig., 5 maps, 1943. [Received January, 1946.]

The author critically discusses the distribution in 'Fenno-Scandinavia', comprising Finland, Norway, Sweden, and Denmark, the ecological relationships, and the taxonomy of *Strobilomyces* (*Boletus*) *strobilaceus*, *B. porphyrosporus*, *B. luridus*, and *B. miniatoporus*.

Jørstad (I.). **Parasitsoppene på kultur- og nyttevekster i Norge. I. Sekksporesopper (Ascomycetes) og konidiesopper (Fungi imperfecti).** [Parasitic fungi on cultivated and economic plants in Norway. I. Sack spore fungi (Ascomycetes) and conidial fungi (Fungi imperfecti).]—*Medd. plantepat. Inst., Oslo*, 1, 142 pp., 1945.

This first instalment of a treatise designed to promote the understanding of the fungal parasites of the cultivated and economic crops of Norway comprises a total of 327 critically annotated entries, of which 260 are Ascomycetes and 67 Fungi

imperfecti. The list includes ten new combinations, namely, *Alternaria exitiosa* (Kühn) n. comb. (syn. *Sporidesmium exitiosum* Kühn, *A. brassicae* (Berk.) Bolle [(Berk.) Sacc.: *R.A.M.*, xix, p. 117]) on turnip, kohlrabi, cabbage, and radish leaves; *A. pluriseptata* (Karst. & Har. ex Peck) n. comb. (syn. *Sporidesmium mucosum* Sacc. var. *pluriseptatum* Karst.; *S. pluriseptatum* Peck 1909), the agent of leaf spot of cucumber and vegetable marrow; *Ascochyta compta* (Sacc.) n. comb. the macroconidial state of *Leptosphaeria pratensis* Sacc. & Briard 1885 [ibid., xxi, p. 121] n. comb. (syn. *Sphaeria meliloti* Lasch 1842, *Septoria medicaginis* Rob. & Desm. 1847, *S. compta* Sacc. 1877, *S. trifolii* Cav. 1880, *Stagonospora trifolii* Fautr. 1890, *S. compta* Died. 1912, *S. meliloti* Petr. 1920 [ibid., xxi, p. 527], and the microconidial state, *Phoma meliloti* All. 1892) on lucerne, white and zigzag clovers (*Trifolium repens* and *T. medium*), *Medicago lupulina*, and *Melilotus* sp.; *A. hortensis* (Sacc. & Malbr.) n. comb. (syn. *S. hortensis* Sacc. & Malbr. 1882, *A. boltshauseri* Sacc. 1891 [ibid., xiv, p. 614], *Stagonosporopsis boltshauseri* Died. 1912, *S. hortensis* Petr. 1921) on runner beans (*Phaseolus vulgaris*), often in a virulent form; *Coleroa elegantula* (Rehm) n. comb. (syn. *Venturia elegantula* Rehm 1885) on *Vaccinium myrtillus* berries; *Diplocarpon maculatum* (Atk.) n. comb. (syn. *Fabraea maculata* Atk. 1909 [ibid., xv, p. 260], *Entomopeziza soraueri* Kleb. 1914, *E. mespili* Höhn. 1920, *D. soraueri* Nannf. 1932), with its conidial state *Entomosporium maculatum* Lév. 1861 (syn. *Xyloma mespili* DC. 1815, *Morthiera mespili* Fuck. 1869, *E. mespili* Sacc. 1882) on foliage of quince, pear, *Crataegus monogyna*, and *Cotoneaster integerrima*; *Mycosphaerella dianthi* (Burt.) n. comb. (*Didymellina dianthi* Burt 1936 [ibid., xvi, p. 255]), with its conidial state *Heterosporium echinulatum* on carnation leaves and calyces; *H. macrospora* (Kleb.) n. comb. (syn. *D. macrospora* Kleb. 1924 [ibid., iv, p. 707]), with its conidial state *Heterosporium gracile* on *Iris* spp., especially *I. germanica*; *Phacidiopycnis purpuracea* (Rost.) n. comb. (syn. *Pyrenochaeta purpuracea* Rostr. 1902, *Phacidiopycnis malorum* Potebn. 1912, *Fuckelia conspicua* March. 1921), the conidial state of *Phacidiella discolor* (Mont. & Sacc.) Potebn. [ibid., xxi, p. 225] (syn. *Phacidium discolor* Mont. & Sacc. 1889), causing a black, shiny storage rot of apples; and *Ramularia grevilleana* (Tul.) n. comb. (*Cylindrosporium grevilleanum* Tul. 1863, *R. tulasnei* Sacc. 1879), the conidial state of *M. fragariae* (syn. *Sphaeria fragariae* Tul. 1856, *Sphaerella fragariae* Sacc. 1882) on strawberry leaves.

Baldacci (E.). **Contributo alla sistematica degli Attinomiceti. IX. Saggio di una classificazione e critica al concetto di spora degli Actinomycetales.** [A contribution to the systematics of the Actinomycetes. IX. An attempt at a classification and a critique of the concept of the spore of the Actinomycetales.]—*Atti Ist. bot. Univ. Pavia*, Ser. iv[a], xiii, pp. 99–129, 1941. [Received February, 1946.]

Continuing his studies on the systematic classification of the Actinomycetes [*R.A.M.*, xix, p. 436], the author describes his own classification of these fungi, and discusses their morphology, with special reference to the formation of 'spores' and similar bodies. Descriptions are given of *Actinomyces bostroëmi*, *A. albus*, *A. sulphureus*, *A. carneus*, *A. madurae*, *A. viridis*, *A. melanosporeus*, *A. innominatus*, *A. bovis*, *A. hominis*, and *Proactinomyces asteroides*.

Christoff [Khristov] (A.). Корекции и бележки върху паразитната флора на България. [Revision of, and notes on, the parasitic flora of Bulgaria.]—*Спис. Земед. Опит. Инсти., България.* [*J. agric. Exp. Stas Bulgaria*], ix, 2, pp. 77–85, 1939. [English summary. Received December, 1945.]

Among revised records in this list of Bulgarian fungi [*R.A.M.*, x, p. 210] are the following: *Gymnosporangium juniperinum* on apple, *Ustilago ficuum* on fig, *Phyllosticta tabaci* on cotton, *Hendersonia conorum* on *Pinus silvestris*, *Septoria ampelina*

on American grapes, *S. graminum* Desmazières on hard wheat [see above, p. 155], *Fabraea maculata* on pears, *Uromyces caryophyllinus* on sweet william (*Dianthus barbatus*), *Marssonina juglandis* on walnuts, and *Botrytis allii* on onions.

Rhoads (A. S.). **A comparative study of two closely related root-rot fungi, Clitocybe tabescens and Armillaria mellea.**—*Mycologia*, xxxvii, 6, pp. 741–766, 5 figs., 1945.

As some mycologists are still inclined to regard the fungus *Clitocybe tabescens* as merely an exannulate form of *Armillaria mellea*, the author stresses the importance of isolating the fungus, in the absence of sporophores, in diagnosing root rots caused by these two fungi, particularly in regions where they both occur. He points out the similarity of the root-rot symptoms exhibited by infected plants, of the general appearance and growth of the mycelial sheets, the development of xylostroma outgrowths extruded through longitudinal fissures in the bark of infected roots, the marked predilection of the fungi for oak roots, and their ability to develop either parasitically or saprophytically. The root rot caused by *C. tabescens* differs, however, in the absence of the black, rounded or flattened, cortical, hypogeal, string-like rhizomorphs, the perforate character of the younger mycelial sheets, and their less fan-shaped type of development at the advancing margins.

While in cultural studies of many isolates of these fungi further striking differences were shown, there was considerable variation among the isolates in growth and rhizomorph production, in readiness of fruiting in the case of *C. tabescens*, in transfers from individual isolates in both species, and a more rapid growth in *C. tabescens* than in *A. mellea*, which never showed the slightest tendency to fruit. The aerial rhizomorphs of *C. tabescens* are short and rather blunt at the tips and remain light in colour, while those of *A. mellea* are usually long and needle-shaped and become dark reddish-brown to blackish. Pure cultures of *C. tabescens* failed to show luminescence, whereas those of *A. mellea*, at least when young and growing actively, exhibited it more or less strongly. The temperature range for optimum growth was distinctly higher in the case of *C. tabescens* than in that of *A. mellea* (25° to 30° C. as against 21° to 25°), which accounts for its largely replacing *A. mellea* in Florida and other south-eastern States. A temperature of 36° was close to the upper limit of growth of both fungi, notably *A. mellea*, and 40° maintained for a month proved lethal to both.

Both fungi on potato dextrose maltose agar exhibited a wide P_H range on the acid side of the scale, starting with 3·9 in one series and 4·2 in another. *C. tabescens* usually grew well at all reactions up to P_H 7·1 in one series and 8·7 in another, but fructification was inhibited on alkaline media, while *A. mellea* appeared distinctly intolerant of alkaline conditions, and growth diminished rapidly after the neutral point was reached. It does not appear, however, that the growth of either fungus is sufficiently limited by the P_H reaction to the medium to offer any practicable application from the standpoint of control measures.

Seaver (F. J.). **Sclerotinia bifrons.**—*Mycologia*, xxxvii, 6, pp. 641–647, 1 col. pl., 2 figs., 1945.

The author repudiates Whetzel's re-naming of *Sclerotinia bifrons* Seaver & Shope as *S. confundans* [*R.A.M.*, xix, p. 569] for the following reasons. Whetzel's claim that the host (*Populus tremuloides*) was misidentified was, in fact, groundless, and the rejection of the original name was illegal under the International Rules of Nomenclature. The correct names and synonymy of the two species occurring on aspens in association with the imperfect *Sclerotium bifrons* should, therefore, be: *Sclerotinia bifrons* Seaver & Shope 1930 (syn. *S. confundans* Whetzel 1940), and *S. whetzelii* Seaver 1940 (syn. *S. bifrons* Whetzel 1940). The imperfect states of these two species are morphologically identical. Their hosts, in the Rocky Mountains and New York State, respectively, are regarded as distinct varieties of *P. tremuloides*.

Waterhouse (Grace M.). **The true nature of Myrioblepharis Thaxter.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 94–100, 1 pl., 4 figs., 1945.

The author, working with a *Myrioblepharis* sp. from a Leicestershire stream, found that this is not a single organism, but a ciliate protozoan, probably a species of *Prorodon*, closely associated with a *Pythium* sp. of the *P. proliferum* type, or with a *Phytophthora* sp. The ciliate settles with its mouth over the tip of the sporangium and grows while situated there; the contents of the sporangium, although not seen to pass into the animal, were not to be found in the vicinity soon after emission. After the ciliate has rested on the sporangium for a time the latter fails to produce zoospores, but releases a mass of protoplasm instead (suggesting that the ciliate is affecting the fungus adversely though not necessarily absorbing substance from it). The newly formed daughter ciliates produced by the mature protozoan have a very short swimming phase before settling on the fungus. These facts are considered to indicate that the animal may absorb nutriment from the fungus, and does not merely perch on it.

Cook (M. T.). **Species of Synchytrium in Louisiana. III. The development and structure of the galls.**—*Mycologia*, xxxvii, 6, pp. 715–740, 12 figs., 1945.

The author describes galls, mostly distinctive, caused by 13 species of *Synchytrium* in Louisiana and held to be considerably more important for description and determination than the characters of the fungi which cause them.

Cutter (V. M.). **The genus Cunninghamella (Mucorales).** —*Farlowia*, ii, 3, pp. 321–345, 2 pl., 1946.

This paper designed to clarify the confused synonymy and overlapping specific descriptions of the genus *Cunninghamella*, presents studies of the type species, *C. echinulata* (Thaxter) Thaxter, and three other species.

Kausche (G. A.). **Ergebnisse und Probleme der experimentellen Virusforschung bei Pflanzen (mit übermicroskopischen Aufnahmen).** [Results and problems of experimental virus research in plants (with ultra-microscopic photographs).] —*Ber. dtsch. bot. Ges.*, lviii, 4, pp. 200–222, 3 pl., 1 diag., 1940. [Received December, 1945.]

Outstanding developments, new at the time of writing, in the experimental study of plant viruses are reviewed and discussed in connexion with the work of the writer and his colleagues at the Biological Institute, Berlin-Dahlem, on the application of ultra-microscopy to various aspects of the tobacco mosaic virus [*R.A.M.*, xxv, p. 83].

Lépine (P.) & Jeantet (P.). **Sur la structure des paracristaux de la mosaïque du Tabac examinés à l'ultramicroscope.** [On the structure of the Tobacco mosaic paracrystals examined under the ultra-microscope.]—*Ann. Inst. Pasteur*, lxviii, 9–10, pp. 466–467, 1 fig., 1942. [Received October, 1945.]

Examined under the ultra-microscope, the crystals of an isolate of the tobacco-mosaic virus from the leaves of infected plants in the Department of Seine-et-Marne, France, presented a fasciculate appearance and minimum dimensions of 7 to 10 by 0·3 to 0·6 and 0·4 to 1·8 mμ, respectively.

Thomson (R.). **Tobacco mosaic. Field investigations at Tobacco Research Station.** —*N.Z.J. Sci. Tech.*, A, xxvii, 2, pp. 104–106, 1945.

In an experiment in 1944–5, one series of plots of 100 tobacco plants each, with four replications, was infected with mosaic (the most widespread and serious disease in New Zealand at the present time) and another kept as far as possible healthy. In the former, the percentages of complete and partial infection and clean plants

were 82·4, 10·4, and 7·2, respectively, the corresponding figures in the latter being 17·8, 25·4, and 56·8, respectively. In 1943–4, the loss from mosaic amounted to 114 lb. per acre, representing a financial loss per acre of £17. 13*s.* 0*d.*, and to a drop in the price per lb. of 1½*d.* In 1944–5 the corresponding figures were 309 lb., £36. 11*s.* 10*d.* and 1½*d.*, respectively.

In 1942–3, 1943–4, and 1944–5, the percentages of infection due to the indiscriminate handling of diseased and healthy plants without washing the hands between each operation ranged from 95·4 to 96, 23·5 to 63·5, and 36 to 67·5 per cent., respectively, compared with a maximum of 5 where the workers' hands were all clean [*R.A.M.*, xxiv, p. 493].

Bawden (F. C.) & Pirie (N. W.). **Further studies on the purification and properties of a virus causing Tobacco necrosis.**—*Brit. J. exp. Path.*, xxvi, 5, pp. 277–285, 1 pl., 1945.

A nucleoprotein absent from the leaves of healthy plants was isolated from those of Canadian Wonder French beans (*Phaseolus vulgaris*) and White Burley tobacco infected by the Rothamsted culture of the tobacco necrosis virus [*R.A.M.*, xxii, p. 377]. It did not crystallize on precipitation with salt-free solutions or during sedimentation by ultra-centrifugation. The nucleoprotein has a sedimentation constant of 498, smaller than that of other plant virus preparations previously investigated. The Rothamsted culture rapidly loses infectivity, and its relationship with the crystallizable protein cannot be exactly defined. It is probable, however, that much of the latter is a non-infective derivative of the virus, sharing many of its physical, chemical, and serological properties.

Van Der Plank (J. E.) & Anderssen (E. E.). **Kromnek disease of Tobacco; a mathematical solution to a problem of disease.**—*Sci. Bull. Dep. Agric. S. Afr.* 240, 6 pp., 1944. [Received January, 1946.]

Tobacco kromnek (tomato spotted wilt virus) [*R.A.M.*, xxiii, p. 411] is a disease affecting growing plants, and the source of infection of any one plant appears to be always another living plant. The virus is not seed-borne, and does not survive in dead tissue or in the soil. The natural method of transmission is by species of thrips which, like the virus, have a wide range of hosts. Herein lies the difficulty of control.

On most susceptible species the thrips multiply freely, but on tobacco leaves they appear to be out of place. The local vector in South Africa, *Frankiniella schultzei*, seldom forms colonies on tobacco leaves, and as a rule a high proportion of specimens taken from tobacco leaves are dead. The mobility of the aphid on tobacco is low, and it does not seem to travel far. *Thrips tabaci*, which can carry the virus, and occasionally occurs on tobacco leaves, also appears to find the leaves unfavourable for breeding and movement, and even for survival. On the other hand, tobacco flowers are much more to the liking of the thrips, though in normal cultural practice Virginian-type tobacco is not allowed to flower, the tops being removed.

The hypothesis on which the authors base their work is that, assuming the absence of weeds harbouring the virus and its vectors, infection is always introduced into a field of non-flowering tobacco from without, and does not spread and multiply within. Migrating vectors arrive from outside, invade the fields, and settle at random on the plants. Here they remain, many soon dying, and the rest being unable, ordinarily, to bring a new generation to maturity.

Hence it follows that, since 100 per cent. of the plants seldom become infected, the proportion of plants which does become affected may be reduced by increasing the density of planting. With a given number of vectors invading a field, the mean number settling per plant will vary inversely to the number of plants per acre, and

the corresponding effect on the proportion of plants infected can be determined from the fact that vectors settling at random will be distributed according to the Poisson series. It may thus be calculated that increasing the number of plants per acre n times reduces the proportion of infected plants from $1—q$ to $1—\sqrt[n]{q}$ where q is the proportion of healthy plants at standard density of planting. Verification of the substantial accuracy of this calculation was obtained experimentally, the figure of the calculated infection being 8·41 per cent. as against 8·11 for the observed infection.

Density of planting may be increased by setting out several plants per hill without changing the spaces between the hills, so that no gap occurs in a row unless all the plants in a hill become affected. With n plants per hill, the proportion of totally infected hills is $(1—\sqrt[n]{q})^n$. A table is given for $n=2$ and $n=3$, which shows that planting in pairs will cope with an epidemic which would have destroyed 40 per cent. of a crop set out in the usual way with one plant per hill. Planting in threes is sufficient for all but exceptionally severe outbreaks.

Denser planting is particularly appropriate during the first month or two after transplanting, when the danger of overcrowding is slight, and stands do not require thinning. This is the period when the danger of kromnek is most acute in the Transvaal.

MATTHEWS (E. M.) & HENDERSON (R. G.). **Yellow Special Tobacco, a new flue-cured variety resistant to black root-rot.**—*Bull. Va agric. Exp. Sta.* 346, 7 pp., 3 figs., 1943. [Received January, 1946.]

The Yellow Special bright or flue-cured tobacco variety, which has been grown on the experimental plots at Chatham, Virginia, since 1933, has shown itself highly resistant to black root rot [*Thielaviopsis basicola*: *R.A.M.*, xxiv, pp. 341, 403]. In 1936, for example, when different varieties were grown in infected soil, Yellow Special plants averaged 40 in. high, as against 27 in. for Yellow Mammoth and 12 in. for White Stem Orinoco. In a further test at Blacksburg, in 1942, in lightly infested soil, the average height of Yellow Special plants on 1st July exceeded that of Fawcett's Special by 0·7 in., while on 28th July the figure was 9·3 in. As Yellow Special has been proved to give leaf of good quality and possesses other desirable characteristics, including resistance to black shank [*Phytophthora parasitica* var. *nicotianae*,], sore shin [*Corticium solani*], and damping off [*Pythium debaryanum*], it is now recommended for general use in Virginia.

SMITH (T. E.), CLAYTON (E. E.), & MOSS (E. G.). **Flue-cured Tobacco resistant to bacterial (Granville) wilt.**—*Circ. U.S. Dep. Agric.* 727, 7 pp., 4 figs., 1945.

Bacterial (Granville) wilt of tobacco (*Bacterium* [*Xanthomonas*] *solanacearum*) [*R.A.M.*, xxiii, pp. 318, 460] has caused increasing losses during recent years in the flue-cured belt of North Carolina and Virginia, and is present also in South Carolina and Georgia. About 20 per cent. of the crop has been destroyed annually in the Granville, Wake, and Durham Counties and on some farms losses amounted to as much as 90 per cent. On an average the tobacco crop has been reduced by 10,000,000 lb. annually. Tests showed that flue-cured varieties were slightly less susceptible than Golden Dollar, Virginia Bright Leaf, and similar varieties, but succumbed under severe wilt conditions. The only prospect of breeding resistant types was to start with fresh material and a collection of strains was, therefore, made from Mexico, Central America, and South America. The Colombian collection, T.I. 448A [ibid., xxii, 181], fair-coloured and of not undesirable aroma, though otherwise of poor quality, showed a consistently high degree of resistance to wilt over several years, including those of exceptionally severe incidence in 1939 and 1943. T.I. 448A was crossed with seven flue-cured varieties, and among the progeny, one line from T.I. 448A and 400 (*Bull. N.C. agric. Exp. Sta.* 337, 8 pp.,

1942), of outstanding promise both in wilt resistance and curing trials, gave selections from the F_3 and F_4 which originated several F_5 lines highly resistant to wilt and producing good-quality tobacco.

In view of the urgent need for a flue-cured wilt-resistant strain, the most promising selection was released to certified growers under the name Oxford 26, whose high resistance to wilt is shown by the fact that, although as many as 20 per cent. of the plants may show symptoms of the disease early in the season, nearly all recover and grow normally except for one or two stunted leaves. Under disease conditions in which less than 1 per cent. of standard varieties remained alive, 95 to 100 per cent. of Oxford 26 plants survived.

Growers are recommended to plant Oxford 26 only on soils where wilt occurs, as losses from black shank (*Phytophthora parasitica* var. *nicotianae*) as high as 75 per cent. have been recorded in this variety.

GARCIA (L. A. A.) & ADSUAR (J.). **Studies on Tomato mosaic in Puerto Rico. A new mosaic disease of Tomato.**—*J. Agric. P.R.*, xxvii, 4, pp. 141–148, 1 col. pl., 1943. [Received December, 1945.]

Seedlings of the Marglobe, King, and Newark varieties of tomato propagated for distribution to farmers were rendered commercially useless in 1942 in Puerto Rico by a mosaic-like disease. Under field conditions affected plants showed in their late stages of growth faint yellowish mottling of the leaves with little or no distortion, and such plants produced fairly good crops. Tomato plants attacked early showed pronounced dwarfing and progressive decrease in leaf size, with leaf deformation. Necrosis of the growing tips was frequently observed. The veins showed a purplish colour, especially on the lower surface, followed by necrosis, which extended to form large blotches. Eventually the lamina disintegrated, leaving the midrib bare, and the stems became heavily streaked with black streaks of varying lengths and widths. New shoots from below the affected parts frequently became diseased. The flowers of severely affected plants were commonly malformed and abortive, and produced at most small and streaked fruits.

Sap inoculations on tomato plants induced systemic mottling and inward curling of the margins and tips of the leaves, on tobacco plants systemic vein-clearing, veinbanding, and chlorotic mottling, and on *Nicotiana glutinosa* vein-clearing, systemic mottling, and chlorosis. In order to determine the possible relation of the virus to that recently reported on chilli pepper [*R.A.M.*, xxiv, p. 494] inoculations were made with tomato, tobacco, and *N. glutinosa* virus extracts, and within six days the inoculated plants showed the characteristic symptoms of the pepper disease. The identity of the virus has been substantiated in every case by the severe vein necrosis produced in the large Bell Hot pepper variety. The properties of the tomato virus in regard to mechanical and insect transmission, longevity in vitro, thermal inactivation, and dilution end point were identical with those of the pepper virus, demonstrating that the latter is the same as the former. Passage of the virus through tobacco or *N. glutinosa* appear to result in increased virulence whereas the opposite effect resulted in passage through tomato.

In a few cases tip-blight symptoms appeared in tomato plants inoculated with virus extracts from tomatoes showing tip-blight, a reaction lost in subsequent transfers, only the faint mottling symptoms persisting. It is considered, therefore, that the blight and necrosis sometimes associated with tomato mosaic is due, either to a single organism, or to its interaction with the pepper mosaic virus in the tomato plant. Until more is known about the tip-blight virus its nature must remain doubtful.

Attempts to recover the pathogen from dried leaves of affected tobacco plants and from necrotic tomato leaves failed, and it is suggested that cutting the diseased plants and letting them dry in the sun *in situ* may be a possible means of control.

As the virus is transmitted mechanically, care should be taken not to carry it from affected tomato, tobacco, or pepper plants while working in seed-beds.

PORTE (W. S.) & WALKER (H. B.). **A cross between Lycopersicon esculentum and disease-resistant L. peruvianum.**—*Phytopathology*, xxxv, 11, pp. 931–933, 1 fig., 1945.

A small population of F_2 plants has been raised at the Bureau of Plant Industry, Beltsville, Maryland, from seeds obtained from field-grown, open-pollinated F_1 progeny of crosses between *Lycopersicon peruvianum*, which is resistant to a number of diseases [*R.A.M.*, xxii, p. 502], and the Prince Borghese tomato variety, the former being used as the male and the latter as the female parent. The offspring of out-crosses between these plants and the Pan America and Rutgers varieties and several hybrid tomato combinations show wide variations in fruitfulness and other characters, and it is hoped that some 25 red- and yellow-fruited selections may prove valuable in the development of disease-resistant horticultural varieties.

MOORE (W. D.) & REYNARD (G. B.). **Varietal resistance of Tomato seedlings to the stem-lesion phase of Alternaria solani.**—*Phytopathology*, xxxv, 11, pp. 933–935, 1945.

Tests were carried out from 1942 to 1944 at Tifton, Georgia, on a number of tomato selections that had shown resistance to the collar-rot phase of early blight (*Alternaria solani*) at the United States Vegetable Breeding Laboratory, Charleston, South Carolina [*R.A.M.*, xxiv, p. 35]. After the necessary eliminations had been made, only five selections remained at the close of the experimental period, viz., three F_3 from the original Marglobe × Devon Surprise cross out-crossed to Pan America, one F_4 from a Cooper Special × Devon Surprise, and one Marglobe selection. The mean number of stem lesions in this group ranged from 248·2 on the Marglobe selection to 25·5 on Cooper Special × Devon Surprise, Marglobe × Devon Surprise × Pan America being intermediate with 34 to 38. These results are considered to justify the use of the selections in a disease-resistance breeding programme. The Targinnie Red, Devon Surprise, and Norduke varieties and their several crosses were also significantly more resistant to *A. solani* than Marglobe.

CALDWELL (R. M.). **Indiana phloem necrosis.**—*Hoosier Hort.*, xxvii, 8, pp. 127–128, 1945.

In this paper (reprinted from *Amer. Nurserym.*, 15th May, 1945), elm phloem necrosis [*R.A.M.*, xxiv, p. 436] is stated to be spreading with alarming rapidity in Indiana, in several cities of which, especially in the south, nearly all the trees have been destroyed within the past two years. For instance, Greenford has lost nearly all its elms, while some 4,000 were killed in Indianapolis in 1944. The Siberian or Chinese and red or slippery elms [*Ulmus pumila* and *U. fulva*] are resistant to the virus responsible for the disease, and should be planted instead of the susceptible American [*U. americana*] in severely threatened areas.

URQUIJO (P.). **Aspectos de la obtención de híbridos resistentes a la enfermedad del Castaño.** [Aspects of the procurement of hybrids resistant to the Chestnut disease.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiii, pp. 447–462, 16 figs., 1944.

Hybridization between indigenous chestnuts and the Asiatic species, *Castanea crenata* and *C. mollissima*, for the development of resistance to ink disease (*Phytophthora cambivora*) [*R.A.M.*, xxiii, p. 375], may be effected either by cross-pollination or by grafting. Full details are given of the methods employed and of the anatomical characters of the hybrids resulting from the 1943 and 1944 operations. Tests of the hybrids for resistance are planned.

Miller (P. W.) & Schuster (C. E.). **Transpiration responses of Persian Walnuts and Filberts sprayed with Bordeaux mixture.**—*J. agric. Res.*, lxxi, 10, pp. 465–469, 1945.

In studies of the influence on the transpiration on walnuts and filberts (*Corylus avellana*) of treatment with Bordeaux mixture against *Xanthomonas juglandis* and *X. corylina*, respectively, the results varied greatly, notwithstanding the consistent use of the basal leaves of plants of the same age and vigour, grown under the same environmental conditions. Differences in the number of stomata might, it is thought, do something to account for this lack of uniformity, although counts on representative leaves of comparable ages on different plants showed no marked differences in the number present. As the plants used were seedlings, the variations may have been due to inherent, biological differences in the individual plants and differences in the fertility of various soil mixtures might also account for structural or physiological differences between different groups of plants. The use of older leaves in these experiments may also possibly be associated with the inconsistencies, as they may not have responded so readily to Bordeaux treatments as younger, more active, leaves might have done.

Beilmann (A. P.). **Some fungus diseases and insects of evergreens.**—*Bull. Mo. bot. Gdn*, xxxiii, 10, pp. 221–223, 1945.

Troublesome diseases on coniferous evergreens in the Middle West of the United States include *Rehmiellopsis bohemica* on white fir (*Abies concolor*) [*R.A.M.*, xix, p. 627], *Sphaeropsis* tip blight of pines [? *S. ellisii*=*Diplodia pinea*], pine leaf rusts (*Coleosporium* spp.), cedar apple rust on juniper [*Gymnosporangium juniperi-virginianae*], and juniper twig and branch blight [*Phomopsis juniperovora*: ibid., xxii, p. 281].

Service and regulatory announcements, April to June, 1945.—*S.R.A.*, *B.E.P.Q.*, *U.S. Dep. Agric.*, pp. 30–32, 1945.

Brazil. Decree-Law 5,478 of 12th May, 1943, prohibits the transit through São Paulo of banana seedlings and pseudo-bulbs on account of Panama disease (*Fusarium oxysporum* var. *cubense*); of citrus trees and plants through Distrito Federal and bordering municipal districts on account of sweet orange scab (*Elsinoe australis*); of cacao trees through Amazonas, Pará, and Território do Acre on account of witches' broom (*Marasmius perniciosus*); of manioc and cassava root (*Manihot* spp.), through Espirito Santo, Rio de Janeiro, Distrito Federal, Paraná, Santa Catarina, Rio Grande do Sul, Minas Gerais, Goiás, Mato Grosso, and São Paulo on account of *Bacillus manihotus*; and *Hevea* rubber trees through Amazonas, Pará, Marannao, Baia, Goiás, Mato Grosso, and Território do Acre on account of South American leaf disease (*Dothidella* [or *Melanopsammopsis*] *ulei*).

Kenya. The list of declared diseases in Government Notice No. 687, Order of 2nd September, 1937, is amended (12th May, 1945) by the addition thereto of tobacco wildfire (*Bacterium* [*Pseudomonas*] *tabacum*), angular leaf spot (*Bact.* [*P.*] *angulatum*), frog-eye spot (*Cercospora nicotianae*), and mosaic and other viruses [*R.A.M.*, xix, p. 384].

Paraguay. By Decree-Law No. 8,051 of 31st July, 1941, the list of declared pests cited in article 11 of Law No. 672 of 3rd October, 1924, has been amended to include in Category A (among those existing in the country) bacterial rot [unspecified] of pineapple, banana bacteriosis [unspecified], 'brusone' disease of rice (*Bacillus oryzae* in association with *Piricularia oryzae*), citrus scab (*E. fawcetti*), orange scaly bark [psorosis], and sugar-cane mosaic: and to category B (among those threatening to invade the country) cassava bacterial wilt (*B. manihotus*), bud rot of palms, citrus root rot [unspecified] and infectious chlorosis, and potato wart (*Synchytrium endobioticum*).